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DISCUSSION ON ACUTE PLEURAL EMPYEMA.

OPENING PAPER
BY

HENRY WADE, C.M.G., D.S.O., M.D., F.R.C.S.ED.,
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THE incidence of an acute suppurative process within the closed pleural cavity is of so frequent occurrence that all of us may claim to have had a wide personal experience of treating it, so much so that I fear with most of us our practice has become standardized, and we have come to believe that with reference to it there is nothing more to be said. When, however, you have come to believe that there is nothing more to be said on any surgical subject, my advice is to come to Newcastle, consult its surgeons and hear especially what Professor Rutherford Morison has to tell you. As one who was for many months the privileged guest of the surgeons of Newcastle I can assure you that you will leave with the conviction that you have still a great deal to learn, and the atmosphere of personal self-satisfaction will have been replaced by one of keen critical observation with a view to improving your surgical judgement and technique. I for one, therefore, am not surprised that this common ailment has been put down for discussion here, and certainly I would be very much astonished if we did not all benefit very much by it.

In opening this discussion I purpose confining myself to those cases where suppuration within the closed pleural cavity has to be dealt with. We learned during the war certain lessons of value in the treatment of empyema following gunshot wounds of the chest. Fortunately, however, this type of injury is unknown to us in civil practice, and therefore it need not be further obtruded in our present discussion, except to apply those lessons we were taught.

I have formed the opinion that I might serve your interests best if, instead of endeavouring to provide you with any statistical analysis of one's own cases, or a critical review of the points of differential diagnosis or exact method of treatment, I rather deal with the subject from another standpoint and consider with you certain aspects of the surgical pathology of this disease and bring before your notice certain points in the comparative surgical pathology of suppuration within the pleural cavity.

In common with all infective processes wherever met with, two factors are essential for the development of a pleural empyema—(1) a living seed must be implanted in (2) a suitable soil. The seeds of infection that are most commonly met with are, of course, the pneumococcus, streptococcus, staphylococcus, and *Bacillus coli communis*. These reach the pleural surface borne in the blood stream, or carried in the lymph stream, or by direct extension from a septic focus in the lung, or through the eroded diaphragm or parietal pleura.

With the common paths of infection we are all familiar, but there is one channel which I am sure is frequently the portal of entrance, and that is through the diaphragm by a lymphatic spread from some primary source of infection within the peritoneal cavity. Any pathologist who has performed many *post-mortem* examinations in cases of acute infective abdominal disease must have been impressed with the remarkable frequency with which in these the upper surface of the diaphragm was injected and inflamed and the neighbouring pleural cavity the site of the earliest stage of infection. We all realize also how the stormy convalescence of a patient recovering from an abdominal suppurative process is so frequently interrupted by the development of a secondary pleural suppuration.

In considering the surgical pathology of a purulent pleural effusion it is, of course, important to realize that in many cases, if untreated, a natural spontaneous cure would result, the different stages and varieties of which we have all observed in the course of our surgical work. This natural cure is brought about by the usual process of localizing the infection by the inflammatory adhesions that surround it. This is followed by the process of dissection, and the abscess comes to point between the ribs and opens on the surface to discharge its contents, or not infrequently it may rupture into an air passage and evacuate its contents—a proceeding that may be followed by an astonishingly rapid and complete cure, so much so that I remember as a student attending a meeting of medical men in the south of Scotland when a certain fine old doctor spoke so highly of this that he seriously advocated this form of natural cure. Some of us, of course, have seen the dissecting empyema which has eroded the diaphragm and come to point on the loin, or even one where it has reached the thigh before it came to the surface.

A natural cure is, of course, possible even without the content of the abscess cavity being evacuated, and this may take place by a process of natural sterilization of the purulent fluid, its inspissation and calcification leading to the formation of a subcostal pleural chest-plate, which, at a subsequent operation, we may find lying beneath the ribs, turning the edge of our knife and almost defying our further passage inwards. With this process of natural cure we are familiar in every known human disease, with the exception of malignant tumours, and even here I am not prepared to say that a spontaneous cure does not sometimes take place.

The justification for our operative treatment resides in the mortality that attends Nature's surgery and the permanent local damage to which it gives rise in its course. From the unevacuated pleural pus virulent poisons are absorbed which produce a profound toxaemia. The fluid exercises a baneful pressure on the lungs and heart, which, if unrelieved, may prove fatal, and where this does not take place a collapsed lung has its stroma inflamed, and an interstitial pneumonia results, producing a cirrhotic lung.

The operative treatment is essentially that of an acute abscess—that is, to evacuate the pus. This is a simple but not always a safe or satisfactory procedure, and to-day I trust we will hear much as to the best technique to employ. The dangers that attend it, as they appeal to me, are first of all those of the operating table, secondly, those of the surgical ward, and thirdly, those of the convalescent home—the first being essentially an anaesthetic risk, the second a dressing risk, and the third the failure of the lung to expand and to rise to the chest wall.

To obviate the first most employ, wherever practicable, a local anaesthetic. Where, however, the age of the patient or his circumstances do not permit of this and a general anaesthetic has to be used, it is my practice to make this the one operation at which the director of the operating theatre, whose commands must be obeyed, is the anaesthetist.

The prevention of a mixed infection arising after the operation, in my opinion, can be best assured where the method of drainage employed is one where the pus is evacuated through a long tube into a vessel containing an antiseptic such as 1 in 40 carbolic.

To promote expansion of the lung it is my belief that the sooner the patient is out of the surgical ward to the convalescent home the better. To bring it to the costal pleura some of us employ the method of lung exercises where water is blown from bottle to bottle. Personally, I am a strong believer in getting the patient up and out into the open air.

As I have already said, many of us on reviewing our cases do not feel absolutely satisfied with our present results, and we are here to seek for better, and we expect to get many suggestions how to obtain these. It appears to me that in our search for them certain valuable lessons are to be learned from comparing the pathology of suppuration within the pleural cavity, the abdominal cavity, and such a joint cavity as the knee-joint, and this aspect of the question I propose now to deal with.

Many—probably most of us here—have witnessed a gradual evolution of the treatment of acute abdominal suppuration, until, at the present day, a stage has been reached which, although capable of further improvement, is in the main most satisfactory. We can remember when,

purulent fluid having been evacuated from the peritoneal cavity, the peritoneum was disinfected with various chemical agents. These proving more harmful than beneficial were discarded, and were replaced by washing out the cavity with an abundant stream of saline solution.

The third stage was where this form of treatment was in its turn replaced by evacuating the purulent accumulation and a process of mechanical cleansing of the cavity and inflamed bowel and the introduction of multiple drainage tubes into the various peritoneal recesses employed. This period was also that when multiple openings were not infrequently made in the dilated and paralysed small intestine with a view to draining off its toxic content.

The present stage may be said to be one of evacuation of the purulent accumulation, closure of the original wound of entrance, with or without the making of a suprapubic stab drain, the most ideal course being to determine the necessity or otherwise of this latter proceeding by examining at the time a film made from the purulent fluid withdrawn; according to the nature and variety of the cells present and the abundance and situation of the organisms the decision for or against complete closure is arrived at.

This satisfactory surgical technique, which has been accompanied by so marked an improvement in the results obtained, has been the result of the joint efforts of the clinical surgeon, the surgical pathologist, and the general practitioner working in cordial conjunction towards a common object.

The clinical surgeon revealed the common portals of entrance of infection—the appendix, the perforated gastric or duodenal ulcer, and the pus tube. He demonstrated how the only rational treatment was to seek at once for this and deal with it. This he taught the general practitioner, and the penalties of delay were graphically pictured by Murphy of Chicago, who preached the doctrine that there was "no surgical treatment for acute suppurative peritonitis."

The surgical pathologist taught us the cause of death in acute suppurative peritonitis, which was never the passage of organisms into the circulation, but always the passage of their poisons only, the streptococcus liberating its endotoxin in thirty-six hours, the *Bacillus coli communis* in forty-eight. The virulence of this poison he demonstrated, and how the natural protective barrier to absorption was the lymph exudate was first shown by Dudgeon and Sargent. To them we owe the recognition of the wisdom of not destroying this barrier by washing it away or by mechanical measures for cleansing the peritoneal cavity. We realized then that instead of washing organisms out of the body we were washing virulent poisons into the system.

To Beattie and others we owe our knowledge of the cytology and bacteriology of a healing peritonitis. They taught us that thick creamy pus may be a sterile fluid, and how a slightly turbid watery discharge may be virtually an emulsion of virulent free germs. They taught us to welcome with joy the appearance of the large mononuclear phagocyte—especially when it was present in abundance—and an active cellular phagocyte. With a microscope in the operating theatre or at the bedside we can thus now determine with an exact accuracy the prognosis of the case and direct the treatment accordingly.

The use of the suprapubic drain, the Fowler position, the value of the intraperitoneal instillation of oxygen, are thus scientifically determined. The rôle of the omentum, the antibacterial properties of the serous exudate, is understood. When to drain and when not to drain, when to remove a drain and when to reinsert it, we clearly realize.

The surgical pathology of suppuration within the pleural cavity is essentially similar. Unfortunately the common portals of entrance of infection are not so suddenly and dramatically revealed, so that they can be dealt with, and the dissemination of infection thereby prevented; but this in its turn will come. In the meantime I would ask you what physician or surgeon has done for the pleural cavity what Dudgeon, Sargent, and Beattie did for the peritoneal cavity? Can the physician tell us more from the study of the fluid drawn off by the aspirating needle than the nature and abundance of the infecting germ? Does he possess cytological data on which he can base an accurate prognosis?

In one case I saw this carried out with success. The story will interest you. As part of my early training to qualify as a surgeon I was for two years one of the pathologists to the Royal Infirmary in Edinburgh. One day there came to the department a certain physician grieved for the fate of a friend from whose pleural cavity he had drawn off a fluid richly laden with large epithelial-like cells, which he could only account for on the assumption of the presence of a carcinoma of the pleura. Beattie was present at the time when the slide was examined, and he was able to reassure him that, contrary to this, the outlook in his friend's case was undoubtedly favourable, as it was a fluid richly laden with the mononucleated cells of the inflammatory exudate from a healing pleurisy, a prognosis borne out by the patient's rapid recovery and the active life as a medical man he has since then led.

I have frequently heard the practice of washing out the pleural cavity condemned on account of its risk on physical grounds; but what of its influence on the lymph's barrier against the spread of infection? To what extent is the examination of the fluid withdrawn used as a guide as to when to drain and when not to drain, and when to remove a drain that has been inserted?

We will now consider the surgical pathology of acute suppurative arthritis of the knee-joint, our knowledge of which has been much increased by the opportunity the war afforded us of studying those cases when it followed penetrating wounds of the joints. When you have reviewed the course of treatment such injuries received during the progress of the war you will agree with me, I am sure, that it followed in its broad outline the course of evolution along which the treatment of acute abdominal suppuration had progressed.

I speak as one who gained his knowledge of this subject in the practical school of bitter personal experience and observation. For three years I was consulting surgeon to the Egyptian Expeditionary Force, and during this period I can confidently claim to have examined the majority of the cases of penetrating wounds of the knee-joint that occurred with the troops of Allenby's army and the wounded prisoners they brought in. At first the effect on one was most depressing, especially when a weekly visit was paid to one of the general hospitals. The sequence of events was so disappointingly uniform.

At one's first visit one was shown by a new, keen and enthusiastic young surgeon a case of early suppurative arthritis of the knee-joint in a young soldier. It appeared to have caused no profound impairment of his general health and to be producing no intense pain. The patient was anxious that at all cost an effort should be made to save his limb, and with an unshaken faith in the most modern method of treatment, the young surgeon was confident of obtaining a successful result. If it was at the period when continuous irrigation by normal or hypertonic saline was being widely employed, one found he had cunningly devised an arrangement whereby a constant gentle stream of the fluid flowed through the joint. At the time all was well, and, reluctant to damp his keenness, particularly as there was nothing better to offer him, one left him hoping that one's unexpressed pessimism would prove unjustified.

At the visit next week, pain, want of sleep, and septic absorption were noticed to be showing their effect on the patient, and locally the wound was not satisfactory; suppuration still continued, pocketing of pus was now commencing, and only too often the patient had set out on a progress which, although interrupted by several attempts to save the limb by operative interference, ended in an amputation through the thigh to save the patient's life.

The progress was so uniform—initial satisfaction, continued suppuration, local pocketing of pus, disorganization of the joint, oedema of the limb beyond, undermining of the patient's health, and finally, the unendurable suffering of involuntary movements of the disorganized articulation, and ultimately amputation.

As with acute suppurative peritonitis, we first of all drained and washed out with antiseptics, then drained and washed out with salt solutions. Then we drained alone and depended on the tubes inserted and the position we put the limb into to achieve our object, which was ready and free escape of the pus. Ultimately we realized the vital importance of the dual factor producing the suppurative process, and as we could not with any degree of certainty remove all the seeds of infection implanted we operated on these cases early, and by excising all the

damaged tissue around the bullet track removed the fertile soil in which they grew and prevented infection developing in the great majority.

In some where this was done and in many where immediate treatment was impossible, suppuration still took place, and in dealing with these the best results we obtained were by the use of bipp according to the method described by Rutherford Morison in the BRITISH MEDICAL JOURNAL of October 20th, 1917.

In certain respects the problem of the infected pleura resembles that of the suppurating knee-joint. When infection is established the vital factor in limiting the spread and destroying it is the formation of the plastic adhesions within the articulations. Continuous or intermittent irrigation prevents this, and is consequently inexpedient. The ideal course of treatment is here again demonstrated to be a closed method.

If the lessons of the peritoneum and the knee are to be applied to the pleura they are:

1. Surgical intervention at the inception of the infection.
2. Removal of the portal of entrance where such is possible.
3. Free and open operation to obtain this will be warranted in many cases.
4. The method of dealing with a case of empyema will be one where the suppurating cavity, having been dealt with, will be closed.
5. The data for an accurate prognosis and scientific treatment will be found in a combined bacteriological and cytological examination.
6. The use of this method will probably isolate a group of cases where complete success will follow a treatment consisting of aspiration of the content of the closed cavity, subsequently repeated if necessary, and combined with the introduction of some mild irritant as is contained in Rutherford Morison's bipp.

The criticism is, of course, warranted that the local factors in operation in a case of acute pleural empyema render the problem of its successful solution so unique as to demand a special line of treatment and to invalidate the application of the analogy of the cure of peritoneal and articular suppuration.

In certain respects this is a just criticism. It is therefore worth our while to analyse carefully the accuracy of the analogy. What evidence exists in favour of the origin of an acute pleural empyema from a single primary focus comparable to the manner in which the perforating appendix produces a suppurating peritonitis or the wound of the knee-joint produces a suppurating arthritis?

The pathogenesis of acute pleural empyema that appeals to me as the most rational is one that accounts for it as usually arising from a sudden escape into the pleural cavity of an infecting fluid brought about by the rupture of a subserous abscess. This primary source of infection will usually be found as a small abscess or necrotic area lying beneath the visceral pleura on the surface of the lung. In certain cases we, however, know that it may be due to erosion of the diaphragm, or an infection through the costal or mediastinal surface of the cavity. Its pathogenesis is therefore very similar to the development of acute suppurative peritonitis secondary to a suppurating appendicitis or perforated ulcer of the stomach.

This idea is not a novel one, and has already been very clearly put forward by Moschcowitz. On theoretical grounds it appeared to him that it was very probable that purulent infections of the pleura were, in the majority of cases, due to a gross contamination of the pleura from a focus on the lung, just as similar infections occur in the peritoneum. According to him, empyema in most instances results from the rupture of a small subpleural pulmonary abscess. The most commonly accepted explanation that the suppurative process arises from the pleura becoming infected by contiguity from the inflamed lung beneath he considered an insufficient explanation. To this theory he points out two objections, the first being that this mode of infection does not occur in any of the other closed serous cavities of the body. As he remarks, a diffuse peritonitis rarely, if ever, occurs unless there has been a perforation of the appendix, or its walls are so necrosed as to permit the easy transmission of bacteria into the cavity. This is likewise true of the other hollow viscera of the abdomen. The second objection is that infection of the pleura by contiguity would presume a direction of the lymph current opposed to that demonstrated and accepted by physiologists and anatomists. To controvert these authorities a double set of lymphatics have been assumed, one passing from the hilum to the pleura, the other passing in the reverse direction. This contention is only a hypothesis and not a fact.

The scourge of influenza—which so frequently produced a virulent empyema—that swept through America in the spring of 1918, provided the opportunity of confirming the presence of small subpleural pulmonary abscesses as the foci from which the infection had reached the pleural cavity. Before this exceptional opportunity for pathological investigation occurred, Moschcowitz many years ago found at an autopsy an empyema that had arisen in this manner. Being on the outlook for it at Camp Lee in the spring of 1918, he found it present in a great many instances. Dunham, who was associated with him on the Empyema Commission, demonstrated a perforated subpleural abscess in every case of empyema that came to autopsy.

The situation of the rupture will determine the type of empyema that is produced. If it be on the convex surface of the lung, as is most common, a general or diffuse empyema results. If the disease is located in a fissure an interlobar empyema results. When the abscess is on the medial aspect of the lung, there are retrosternal pus pockets between the lung and the mediastinal pleura.

He cites a further proof that ruptured subpleural pulmonary abscesses occur in empyema in the frequent experience that irrigation of empyema cavities with an irritating solution, such as Dakin's solution, results in coughing and choking, showing that communications exist with an air passage. He believes these communications exist in every empyema. When rupture takes place the circumstances for the development of a rapid and diffuse infection are favourable owing to the presence of a small amount of serous fluid in the pleural cavity which is present in every case of diffuse pneumonia, this serous accumulation being exactly comparable to that which is found within the peritoneal cavity where an unruptured infection exists within the abdomen.

If it be granted that such is the common mode of origin of an empyema, it would appear at first glance that the rational surgical treatment would be early operation to deal with this portal of entrance by its removal, disinfection or closure, as the appendix is amputated or the perforated duodenal ulcer closed. But can the pleural cavity be opened with the same freedom, facility, and safety as the peritoneum or the knee-joint?

In Breslau, eighteen years ago, I assisted at several operations in Sauerbruck's pneumatic chamber, and it was then thought that the pleural cavity could only be opened inside a building resembling closely the gun turret of a battleship. As far as I am aware, a Sauerbruck's pneumatic chamber has never been constructed in this country, and I think the continent of America only possesses one, so that as a practical proposition it is ruled out. This negative pressure method has therefore been replaced by simpler and more practical positive pressure apparatuses that achieve the same object. The unique experiences the war afforded modified very much our outlook on this problem, however, and the impression left on the minds of many of us was that under ordinary anaesthesia the pleural cavity could be opened with a safety, freedom, and facility not unlike that experienced in an exploratory laparotomy.

Is this impression justified? The recent experimental investigations of Graham and Bell will help to answer this question. In their experiments they found that normally the mediastinal structures are so mobile that they offer practically no resistance to pressure on either side. From the standpoint of pressure relationships the thorax may be considered as one cavity instead of two. Roughly speaking, the degree of asphyxia which will follow the creation of an open pneumothorax will depend upon (1) the relationship of the amount of air entering through the pneumothorax opening to the amount of air permitted to pass down the air inlets to the lungs, and (2) the ability of the individual to compensate by increasing either the rate or amplitude of his respiratory movements, or both.

They noted that the ability of the animal to withstand an open pneumothorax is dependent upon his ability to

compensate by increasing his respiratory effort, and it was a very striking fact that usually the restoration of negative pleural pressure could be instantly accomplished by simply closing the pleural opening, thus making it a closed instead of an open pneumothorax.

In investigating the relationship of amount of air entering the thoracic opening to amount of air entering lungs they showed that an opening about 5 by 10 cm. (2 by 4.1 inches) is the largest at which compensation can be theoretically established in the human being, even for short periods, if the mediastinum has normal mobility. As regards their experimental results and the clinical findings in war wounds of the thorax, they claim there is no discrepancy, for, as they point out, in the latter case, although the opening made may originally be large, by the packing off of the cavity and other means it is reduced in calibre by the surgeon in all cases. A healthy adult without pneumonia and with good respiratory muscles should be able to stand for a short time without death an opening of about 51.5 square cm. (5 by 10 cm., or 2 by 4.1 inches).

The almost instantaneous response in the character of the respiratory movements which follows the creation of an open pneumothorax cannot be satisfactorily explained at the present time. It is not due to asphyxia. It is not due to the stimulation of nerve endings by the admission of cold air.

The anatomical and physiological difficulties in carrying out a free and open exposure of the pleural cavity are therefore such as to answer our question in the negative. But still the dangers and difficulties are not insuperable, and they therefore alone do not veto the operation. A much more serious contraindication to an early free exploratory opening of the chest in such cases is the fact that in the great majority of empyemas it is associated with pneumonia, and at this stage the patient is in a state of profound toxaemia and a most unsuitable subject for such treatment.

The test of actual experience of the early operative treatment of empyema was recently afforded in the United States of America, where during the influenza epidemic so many cases occurred in their large military training camps. The mortality attending this treatment was extremely high, and the Empyema Commission that was appointed to investigate this subject came to the conclusion that "the evacuation of the pleural exudate by operation early in the disease involves greater risks without compensating benefits than the removal by aspiration. Much of the relief offered by operation without its attendant dangers can be afforded by aspiration repeated according to indications. The condition of the patient at this time calls for medical rather than surgical treatment." Graham and Bell experimentally confirmed the accuracy of these clinical findings in their cases of empyema experimentally induced in dogs.

The dogs that had had early drainage showed a slightly higher mortality than those which received no treatment of any kind. In their general discussion they claim to have definitely established that an operation for empyema performed too early in the course of the disease is accompanied by such very grave danger that in their opinion the risk of harm by operation outweighs any advantages which it may have. They consider the safest time to operate is where the exudate is becoming frank pus, then there is less danger of creating an open pneumothorax, and the patient is in a much better condition to withstand its harmful effects.

When a case is treated by repeated aspiration it is interesting to observe how, occasionally, the pus becomes sterile. I have observed this sterility under two forms—that where free organisms are absent from the films made and no growth is obtained on culture, or, as I have observed recently, where streptococci were present in the films made but no growth occurred when suitable media were inoculated. No surgical ailment probably requires more careful investigation before treatment is carried out, and none repays better an accurate and exact study.

The exact diagnosis of an acute pleural empyema is made on the general signs the patient reveals of profound septic absorption, the physical signs of accumulation of fluid within the cavity, and the detection of pus when the exploring needle is introduced. Of all the methods of physical examination the one that appears to me most satisfactory is an *x*-ray examination of the patient. The screen is of more value than the plate, and where the patient can be examined in the upright posture the most exact diagnosis of the situation of the fluid and the effects it is producing in the neighbouring organs can be made. Where repeated puncture has failed the *x* rays will frequently clear up the doubts entertained.

When operation is undertaken adhesions fortunately have formed which prevent a widespread collapse of the lung, but the firm inflammatory exudate that is coating it and the interstitial pneumonia throughout its substance are factors that interfere with its rapid expansion. Our attention is therefore directed to the solution of the problem as to how we can most rapidly and successfully sterilize the cavity and cause it to rise to the costal pleura. Can this be most rapidly accomplished by the Carrel-Dakin method of treatment?

The value of the Carrel-Dakin method of draining a suppurating wound has been fully tested by a number of investigators in cases of recent acute empyema. The general consensus of opinion would appear to be that in such cases the end achieved does not justify the labour expended on it. The mortality of the disease has not been appreciably influenced by it, nor has the process of healing been expedited. Those who have employed it most claim that its special sphere of usefulness is in cases of chronic empyema with a persistent discharging sinus where the lung has failed to rise to the chest wall and obliterate the cavity. They claim that the thick rind of dense inflammatory tissue that is coating the lung and covering the pleura is softened and dissolved by the use of this chemical agent, so that, in addition to the cavity being cleansed, it is also rendered more mobile and the rise of the lung facilitated.

The most recent records of the Mayo clinic show that most excellent results follow this line of treatment in such cases. Hedblom, under whose care these cases are placed, makes a routine practice of carrying out a period of preliminary Carrel-Dakin treatment with all of them when they first come under his supervision. In some no further treatment is required, the cavity being entirely obliterated. In all the dimensions of the cavity are diminished, and, being rendered more sterile, subsequent operation is easier and safer.

When considering the possibility or advisability of early or primary closure of the empyema cavity that has been opened by operation we have, as I have said, our experience of the peritoneum and knee-joint to guide us. We also know that the usual natural method of healing in the ordinary case is one where the lips of the wound usually are sealed some considerable time before the lung has risen to the chest wall, an *x*-ray photograph in such cases showing the closed pneumothorax that remains for many days after the wound is healed.

Can we not, therefore, in suitable cases anticipate this by primary closure at the time of operation? If so, our natural guide as to the case that is suitable for such treatment would appear to me to be the one we employ in the abdomen—the cytological and bacteriological findings observed in the fluid withdrawn—our prognosis being based on the nature of the cells present, the abundance of the mononucleated cells of the inflammatory exudate, the activity of the phagocytosis of the polymorphonuclear leucocytes, the presence or absence of free organisms, and the extent to which they are being phagocytosed by the leucocytes.

The treatment of the persistent chronic empyema cavity hardly comes into our present discussion, but as it has been raised already in referring to the use of the Carrel-Dakin method of treatment, it suggests one other thought to me. I would like to bring forward a suggestion which perhaps is worthy of being tested, and it is whether a similar or even better result might not be obtained by the use of bipp, or possibly even simple paraffin, which has the great advantage over Dakin's solution of being able to be used in a closed cavity. I suggest this owing to certain observations that I was able to make during the war. We employed bipp in many cases of septic wounds. One feature was most noteworthy in all of them, and it was the astonishing change that took place in the degree of induration of the neighbouring parts even where it had failed to cure the source of infection—as where a knee-joint had been bipped and amputation later on had to be carried out. At the time of the original treatment the inflamed parts in the neighbourhood of the wound were firm, tense, and indurated and fixed together; whereas a

week or two later, as was confirmed at the operation, they were soft, pliable, and mobile. It appears to me that the paraffin in the remedy was probably responsible for this, and in support of this idea I would quote the results obtained by the use of ambrine, or No. 7 paraffin, in the treatment of burns. In these cases a similar result followed its use. Soft and delicate tissues surrounded the site of the primary damage, so that when the wound healed the best and most delicate of scars resulted. Beck's paste probably also owes its great value to a similar cause.

In opening this discussion on acute pleural empyema I realize clearly that there are many other aspects of this subject which warrant full and careful criticism, but I would desire to offer as my contribution the following suggestions:

1. A combined cytological and bacteriological examination of the fluid withdrawn should be more widely employed, as offering the prospects of affording fuller and more accurate data on which to found our operative treatment.
2. Suppuration within the pleural cavity is especially suitable for treatment by methods which obviate the necessity for opening the chest, or by methods where an immediate or early closure after it has been opened are carried out.
3. The value of the treatment by aspiration alone should be again carefully reviewed.
4. The value of methods where, after aspirating the content, an antiseptic is introduced, such as Murphy's method, where 2 per cent. formalin in glycerin is introduced, should be further considered.
5. Where simple drainage is practised the ideal opening is not only one which allows free escape of the purulent content at the time, as when a rib is resected, but it should also be such as will readily seal itself off when the tube is withdrawn, as when minor intercostal thoracotomy is performed.
6. The benefits to be derived from a free opening of the pleural cavity by major intercostal thoracotomy warrant its employment in cases which give promise of developing into chronic and persistent cases.
7. The value of disinfection and immediate closure in these cases should be more fully tested.
8. The Rutherford Morison technique is the best at present available for carrying out the same.

DISCUSSION.

Mr. ANDREW FULLERTON (Belfast) emphasized the analogy between the knee-joint, the peritoneal cavity, and the pleural cavity. The drainage tube had been completely abolished in the treatment of infections of the knee-joint during the late war. It was used much less frequently now in the treatment of infective conditions of the peritoneal cavity, and the same evolution of treatment was evident in the case of the pleural cavity. With our present knowledge it might be impossible to abandon the use of the drainage tube altogether in chest cases, but it should be removed as soon as possible to avoid secondary infection from the outside. It might not be possible, as the result of this discussion, to lay down rules for the treatment of acute empyema, but Mr. Wade had crystallized the opinion of modern surgeons as to the management of these cases. Aspiration might first be tried; if this was not successful the pleural cavity might be opened, fibrinous masses, clots, etc., turned out, and the cavity closed without drainage. Later, as a last resort, the drainage tube might be necessary, but every precaution should be taken to prevent secondary infection, and the tube should be dispensed with as early as possible.

Mr. T. P. DUNHILL (London) said: There are three points upon which I would like to speak. First, it has been established that it is possible to close a thorax, after removing the infecting foreign body and evacuating the fluid. In some cases subsequent daily aspiration is necessary. The same procedure is possible in cases of acute pleural pneumonia. Not every case of primary suture will be successful, but the fact that some are justifies the procedure in such cases as it appears possible. The cavity should be emptied by suction, not by swabbing. Secondly, there are certain cases in which pus is suspected, but cannot be readily detected. In many such cases my chief, Mr. Gask, has performed what is really an exploratory operation. Where there are real grounds for suspecting the presence of pus, it has, I believe, always been found, though often far from the place where it has been thought to be. I am sure this procedure will prevent many cases from becoming very ill, and so necessitating an operation when they are less able to stand it. Thirdly, with regard to anaethesia. In this latter type of case I should like to speak of the value of intratracheal anaesthesia, as introduced by Mr. Kelly. It is not suggested that it should be used in acute cases associated with pneumonia, but for the cases where one has to spend some time in carefully searching, intratracheal anaesthesia gives a degree of comfort and safety not attained by any other method.

Mr. PURVES said: Mr. Wade has made reference to the knee-joint cases which he and his colleagues had to deal with in the East. I am glad to have this opportunity of emphasizing his remarks as to the change in results consequent on the application of the principles laid down by Professor Rutherford Morison. Prior to the adoption of them the results of knee-joint infections were disheartening. There appears to me the strongest encouragement to adopt the line indicated by Mr. Wade in these cases of acute pleural infection, the results of which are too often disappointing.

Mr. G. H. EDINGTON (Glasgow) said: The question of the bacteriology of the individual case is of importance, the most favourable in my experience being the pneumococcal cases. Further, the physical character of the exudation would seem to have some connexion with the prognosis: those cases where pus is thick and where there are bulky fibrinous masses present heal more rapidly. If the exudate be watery, the patient's general condition is not so good, and convalescence is slower. I believe that chemical or physical interference with the pleural sac should be reduced to a minimum. I never wash out or sponge out the cavity; the most I ever do is to loosen fibrinous masses with the finger. Even if the pus be stinking it is usual to have the discharge become quite sweet in a day or two. Success depends largely on attention to asepsis, and with due care in dressing the drainage tube need not be looked on as inviting secondary infection. As a rule, in acute empyema I find myself able to dispense with the tube in from seven to fourteen days. I think that Mr. Wade's comparison between pleura and peritoneum is a little misleading. The abdomen is not a rigid cavity like the thorax; and, in the latter, adaptability rests almost entirely with the lung, which, to begin with, has its normal expansibility impaired, and so obliteration of cavity is delayed.

Mr. JAMES BERRY (London), speaking as a former surgeon to a chest hospital, desired to emphasize two small points which he thought of some practical importance. The first concerned the operation for large empyema with considerable dyspnoea. In such cases it was of the utmost importance that the patient, whether under a general or local anaesthetic (and he thought the latter often preferable), should never be turned over towards the sound side, as this threw the whole weight of the fluid on to the sound lung, and was not unlikely to cause great increase in respiratory distress or even sudden death. He was in the habit of operating upon such cases from below, keeping the patient upon the back, but with the whole of the affected side projecting beyond the edge of the operating table, the patient being held in that position by an assistant. The operator sat on a very low stool, and could thus open the thorax as far back as he desired without any disturbance of the patient's dorsal position. The other point concerned after-treatment. It was of great importance to get the lung to expand as soon as possible after operation. He had found that laying a rather large square of gutta-percha tissue directly over the operation wound favoured expansion of the lung by causing a valve-like closure, allowing fluid to exude freely from the thorax beneath the tissue, but preventing air from entering the pleural cavity during respiration.

Mr. F. C. PYBUS (Newcastle) said that he had been profoundly dissatisfied with his results. He regarded early

diagnosis as of greatest importance. Of late he had been making a larger incision and had been irrigating the pleural cavity with flavine and also mopping out the cavity. It was important to get the patient out of bed as soon as possible.

Mr. ALBERT LUCAS (Birmingham) said that the most important point was the nature of the infection; pneumococcic infections would clear up readily, but not so streptococcic infections. His practice was repeated aspiration, and if the result after a number of times was not satisfactory then he found it necessary to drain. The cases met with in war were not comparable to those in civil practice. The presence of the foreign body made all the difference. There was some danger in carrying too far into civil life the practices of war surgery of the chest. He agreed with the condemnation of the drainage tubes. The danger of the anaesthetic in performing the drainage operation was lessened by the method of repeated aspiration. The application of elaborate methods of drainage as that suggested by Mr. Wade was worse than the use of the drainage tube. It was of importance to get the patient out of bed and into the fresh air.

Mr. C. P. CHILDE (Portsmouth) emphasized the danger of drainage tubes, and pointed out that close personal attention to these cases was necessary. He mentioned one extreme case in which he had removed three large drainage tubes which had been lost in the pleural cavity of a soldier.

Mr. H. N. FLETCHER (Brighton) emphasized the importance, while giving drainage to the pus, of at the same time keeping the chest wall "closed," avoiding the entry of the outside air into the pleural cavity. This was of great importance in allowing expansion of the collapsed lung. Further, one of the lessons of the chest surgery of the war was the marked improvement in the patient's general condition directly the wound in the chest wall was closed and the sucking in and out of air discontinued. The question arose as to which cases could be safely sewn up after washing out, etc., and which not. Here the surgeon should be guided by previously ascertaining the bacteriology and cytology of the pus, as laid down by Mr. Wade. Should the case be one of pure pneumococcal infection, it would probably be safe in most cases to close the chest wall, having first washed out the pus, lightly swabbed off all the fibrinous clot from the pleural surfaces, and finally siphoned off all remaining fluid from its cavity. Should, however, streptococci or *B. coli* be present, the following method of dealing with the situation was suggested—namely, to do as before, but to close the pleural muscles and skin tightly round a rubber tube of small calibre, just long enough to traverse the chest wall and no more, stitch it to the skin, and insert a glass stopper in the outside end. This stopper should be removed twice daily, and the patient, lying so that it was in the most dependent position, should be asked to cough out what fluid remained —that is, with each expiration—while with each inspiration the tube was nipped so that no air could enter the pleural cavity. The stopper was then replaced. The tube was removed as soon as the temperature had been normal for three to four days, and as soon as the bacteriological and cytological examination of the fluid coughed out showed definite evidence that the infection had been satisfactorily overcome. Mr. Fletcher cited a case of serious streptococcal and pneumococcal infection in which this method had answered admirably, the wound being healed, with good air entry into the lung, in three and a half weeks.

Dr. W. MARTIN (Cardiff) had found the chief difficulty in the anaesthesia, and advocated local rather than general anaesthesia. He thought that a drainage apparatus was of importance, and suggested a short tube with a rubber flange all round which could be made to adhere to the skin; attached on the outer side of this flanged tube was a short rubber tube which would collapse and prevent the entrance of air into the pleural cavity while not interfering with the exit of pus.

Mr. HADLEY (Western Australia) thought that sufficient attention had not been paid to the focus of infection, and he would have been glad of some information as to why some cases of pneumonia were complicated by acute empyema and others were not.

Mr. MCADAM ECCLES (London) said that, when an undergraduate, both the abdominal and the thoracic cavities were sealed spaces, to explore which was almost impious. Some felt that to leave the patient who had infected fluid in the abdominal cavity to die was criminal. Boldness in opening the cavity proved that if Nature was in this way helped, the patient recovered because the peritoneum was well able to take care of itself. The thoracic cavity had remained sacred longer than the abdominal. He had now come to the conclusion that the pleural cavity dealt with infective material even better than the abdominal, provided that the actually infected area was accurately found and the fluid completely evacuated. Drainage with the shortest of tubes was not essential for longer than forty-eight hours. Then he believed in secondary suture of the skin incision. This not infrequently held perfectly, but if not, a further small opening through the primary incision evacuated a much less infected fluid, and the pleura then dealt with the remaining infection. In pneumococcal cases the wound should be closed in forty-eight hours; in streptococcal, closure must not be undertaken until the temperature had been normal for at least four days. Closure meant quicker expansion of the lung; continued drainage meant retraction of the lung.

Mr. C. FIRMIN CUTHBERT (Gloucester) said he thought that after opening a chest for acute empyema it was very important to maintain asepsis during the whole period of after-treatment, and subsequent dressings ought not to be entrusted to nurses. After the first outrush of pus the finger should be inserted as far as possible towards the vertebrae to remove any masses of thickened pus and also to be quite sure that no separate loculations of pus were locked up. So often it happened in the convalescence of a case of empyema that the temperature went up again and the patient was very ill. When the finger was inserted into the pleural cavity a further pocket of pus was let out. For some years he had been in the habit of not using a drainage tube but of passing into the chest one very long strip of gauze bit by bit so as to prevent adhesions taking place in the pleural cavity and thereby leading to such loculations of pus. The presence of the gauze against the surface of the lung seemed to act as a stimulus for the lung to expand, and also to prevent adhesions from forming and therefore mechanically interfering with rapid lung expansion which was so essential. The presence of the gauze strip packing also closed what would otherwise be a suction wound of the chest, which had the effect of producing a further collapse of the lung and which it was essential to avoid. The long gauze strip should be removed each day and a fresh strip packed in bit by bit. It was surprising how easily this dressing was done and how quickly the lung expanded; within a fortnight only a very short strip of gauze could be passed into the rapidly closing cavity.

Brevet Lieut.-Colonel F. P. CONNOR, D.S.O., I.M.S., expressed disappointment that a greater advance had not been made in this branch of surgery. As compared with the treatment of suppurative conditions of the abdomen, the results of the treatment of acute pleural empyema left much to be desired. The condition resembled in some respects acute abscess of the liver, though the pathology was very different. In India aspiration was tried as a preliminary measure to ascertain the nature of the infection and to relieve symptoms. If operation became necessary a free opening was made and a drainage tube avoided if possible. More knowledge was wanted as to the exact site of origin of pleural empyemata. If the cause could be treated more efficiently, whether in the lung or hilum, recovery would be much more rapid.

Mr. W. S. DICKIE (Middlesbrough) thought the discussion had been regrettably vague, dealing chiefly and often apparently on opposite lines with points of detail. This was due to the fact that there had been no clear initial definition of what was meant by acute pleural empyema. Acute infective pleural conditions presented themselves in different forms demanding different lines of treatment, and no one method was universally applicable.

Mr. ARTHUR COOKE (Cambridge) deprecated the pessimism of the last two speakers and stated that this discussion could not have taken place ten years ago, as treatment by the open method would then have been

agreed to unconditionally. Now the treatment of empyema was in a transitional stage, and most speakers who admitted they used a tube did so with reticence and almost with shame. Were it possible to remove the source of infection in the thorax as it was in the abdomen by excision, probably more cases would lend themselves to immediate or early closure. As it was, the time factor and the nature of the infection were of great importance, and cases should be treated in groups either by aspiration, opening and closing, short drainage, or prolonged drainage.

Mr. H. S. SOUTTAR (London) thought that the success of operations for empyema depended on close attention to detail. He agreed that they were best performed under local and regional anaesthesia, but considered that under many circumstances this was not practicable. When a general anaesthetic was employed it was important that the patient should be placed on the affected side and almost on the face, and not afterwards moved. The incision should be placed at the lowest point of the cavity and just behind the mid-axillary line for the comfort of the patient and to avoid occlusion by the collapsed lung. It should be large enough to allow of thorough exploration. If large enough, the opening would act in a valvular manner, no tube would be necessary, and the opening would close without secondary suture.

Reply of Opener.

Mr. HENRY WADE, in reply, said: A previous speaker has criticized unfavourably the fact that so many of those who have taken part in the debate have confined their remarks to questions of detail in the treatment of cases of acute empyema. I am sure I am only voicing the general feeling of this meeting when I say that in holding such views he is in a minority of two. We all have valued extremely the points in his technique that Mr. James Berry has narrated to us, and we are unanimously of the opinion that it would have been impossible for a clearer and more succinct or more valuable description of the operative treatment to have been given by anyone than that we have just had the privilege of listening to from Mr. Souttar. I am extremely glad to find that the suggestion I put forward with reference to a more extensive cytological and bacteriological examination of the fluid withdrawn in cases of acute pleural empyema has been so favourably received. Certain speakers have referred to the prognostic value of the type of organism revealed on examination. Thus we have heard it stated that where the pneumococcus is present the infection may be assumed to be of a milder nature than where it is a streptococcus. In my opinion this conclusion is not warranted in all cases, for not only does the pathogenicity of the individual organism vary with the individual strain, but also to a very considerable extent with the nature of the soil in which it is implanted. As an illustration of this I would remind you that the pneumococcus was found in many cases to have been the virulent and deadly organism that carried off so many men in the prime of life during the terrible influenza epidemic that occurred in the last months of the war. I am sure many like myself have met with cases of streptococcal infection that were mild in nature and rapidly cured. In conclusion, Mr. President, I wish to thank yourself and this meeting for the kind reception given to my paper and for the many valuable lessons I have learned from this discussion.

INTUSSUSCEPTION: AN ANALYSIS OF THIRTY-SIX CASES.

BY

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THE following series represents all cases of intussusception in which I operated during the period April, 1903, to February, 1914. The case summaries are followed by an analysis and consideration of the main points illustrated.

A. SUMMARIES.

Case 1.—Male, aged 4 months, April 19th, 1903. Two days' vomiting and blood per anum; sausage-shaped swelling; rectal examination negative. *Operation:* Ileo-caecal intussusception reduced by pinching; caecum opened to confirm reduction demonstrated great thickening of ileo-caecal valve. Death twenty hours later.

*Case 2.**—Male, aged 18 months, August 21st, 1904. Two and a half days' vomiting and pain; no tenesmus; enema brought away blood; rectal examination, blood and slime. *Operation* showed irreducible ileo-ileal variety; sheath gangrenous, and at four inches from its upper end a Meckel's diverticulum which did not participate; resection. Death in six hours.

Case 3.—Male, aged 4 months, October 14th, 1904. One day's vomiting, straining, and blood and mucus per anum; abdominal swelling above and to left of umbilicus. *Operation* showed ileo-colic extending to just beyond splenic flexure; reduced by pinching, but last inch or so required traction, ileum being much thickened. Recovery.

Case 4.—Male, aged 3 months, January 6th, 1905. Five hours' screaming, vomiting, and straining; blood per anum; apex 1½ inches in from anus; swelling left hypochondrium and flank. *Operation* showed ileo-caecal type, easily reduced except from mid-transverse colon back; enlarged mesenteric glands. Recovery.

Case 5.—Male, aged 5½ years, March 20th, 1906. Fall downstairs seven days before; abdominal pain, vomiting, constipation; enema returned bloody; abdominal facies, visible peristalsis; swelling left iliac fossa. *Operation:* Ileo-ileal, with gangrene of entering and sheathing layers; resection of 99 cm. of bowel. Death in two and three-quarter hours.

Case 6.—Male, aged 70 years, August 31st, 1906. One day's vomiting and diarrhoea; motions bloody; swelling right iliac fossa; hiccough and spasms of pain. *Operation:* Ileo-caecal extending to splenic flexure, with entrance remaining in right iliac region; reduced. Recovery.

Case 7.—Male, aged 4½ months, September 6th, 1906. Sixteen hours' crying, spasms of pain, blood per anum; swelling lower abdomen behind left rectus; apex just within anus. *Operation:* Rectal injection of one pint reduced swelling to ascending colon; caecum brought out for completion of reduction; ileo-caecal. Recovery retarded by severe gastro-enteritis.

Case 8.—Female, aged 1 year and 9 months, March 28th, 1907. Two days' vomiting and screaming, followed by blood per anum; ovoid mass right iliac fossa directed towards umbilicus. *Operation* showed ileo-ileal, beginning 6 in. up from ileo-caecal junction, and extending through ileo-caecal valve (ileo-colic) to transverse colon; large intestine emptied by pinching; but ileal part jammed and sheathing bowel gave way. Resection. Death in thirty-six hours. Part removed about 20 in. long; returning layer oedematous and greenish.

Case 9.—Male, aged 2 months, April 26th, 1907. Twenty hours' vomiting and passage of blood and mucus from bowel; vertical sausage tumour to left of hypogastrium; apex just within anus. *Operation:* Ileo-caecal, with difficult reduction at splenic flexure, also jamming at hepatic flexure; rupture of colon on manipulation: resection. Death in twelve hours. No gangrene, but great oedema of intussusceptum. Resected portion measured 12 to 14 in.

Case 10.—Female, aged 10 years, June 14th, 1907. Fourteen days' vomiting and constipation; abdominal facies; dullness right iliac fossa; no blood or mucus passed. *Operation* showed easily reduced ileo-ileal with gangrene; resection of loop, and Paul's tubes. Death in fifteen hours, apparently from toxaemia.

Case 11.—Female, aged 7 months, June 27th, 1907. Four hours' crying and vomiting; slime per anum; subhepatic tumour. External manipulation reduced tumour, with gurgling. *Operation* showed about 1½ in. of ileum intussuscepted into colon; ileo-colic type; reduction easy. Death in forty-eight hours; temperature 103° F.

Case 12.—Male, aged 10 months, July 1st, 1907. Eight hours' crying, vomiting, and passage of bloody mucus from bowel; tumour in situation of transverse colon. Under chloroform, tumour manipulated into right iliac fossa; then one pint of hot water run in, after which hardly noticeable fullness in ileo-caecal region. *Operation* showed about one inch of intussusception remaining; reduced by pinching and traction; caecal dimple observed and pinched out; caeco-ileo-caecal type. Recovery.

Case 13.—Male, aged 4 years, July 8th, 1907. Twenty-four hours' pain, vomiting, and passage of blood and slime; tumour left flank; tumour reduced by manipulation and irrigation, but always recurred. *Operation* showed colo-colic intussusception in sigmoid; reduced by pinching; transverse and part of ascending colon lumpy and irregular. Recovery.

Case 14.—Female, aged 5 months, October 23rd, 1907. Nineteen hours' crying, vomiting, and bloody motion; subhepatic tumour; injection returned with blood-stained shreds and mucus. *Operation* showed colo-colic intussusception at splenic flexure, about 3 in. long; reduced by pinching, and after reduction constriction found in ascending colon, 3 to 4 in. up from caecum, and apparently marking junction of returning layer with sheath; enlarged mesenteric glands. Recovery.

Case 15.—Male, aged 7 months, February 13th, 1908. Signs (not specified) for twenty-six hours; vertical tumour to left of middle line and down into pelvis; apex felt in rectum; injection diminished swelling, which retreated to splenic flexure.

*For details vide *Transactions*, Glasgow Pathological and Clinical Society, vol. x, 1903-05, p. 113

Operation showed complicated type, ileo-ileal, ileo-colic, ileo-caecal; reduction easy except for last inch or two of ileum, which remained fixed after caecum freed; reduced by prolonged squeezing; oedematous part of ileum very hard, 1½ in. long, and clear bowel between it and ileo-caecal junction. Recovery.

Case 16.—Male, aged 5 months, March 24th, 1908. Almost three days' symptoms (not specified); apex in rectum; tumour to left of middle line, down into hypogastrium; manipulated and fluid run in. *Operation:* On opening abdomen, brought out bowel; intussusception in ascending colon, short of hepatic flexure; ileum easily reduced; caecum remained invaginated and reduced with difficulty. Death, twenty-second day, from gastro-enteritis, which commenced fifth day. Type was caecal, ileo-caecal.

Case 17.—Male, aged 4 months, August 1st, 1908. Tenesmus for some weeks; twenty-four hours ill and passing blood and mucus; subhepatic tumour, horizontal; injection. *Operation:* Tight intussusception of ileo-colic type in ascending colon; reduced by pinching; last three inches of ileum hard, thickened, and crushed. Recovery.

Case 18.—Male, aged 5 months, August 2nd, 1908. Twenty-one hours of crying and with bloody stools; transverse mass to right of umbilicus disappeared with irrigation. *Operation* showed a completely reduced ileo-caecal intussusception; caecum and neighbouring colon and last three inches of ileum bluish, thick-walled, and hard. Recovery.

Case 19.—Male, aged 4 months, April 29th, 1909. Sixteen hours' crying and straining; five hours later passage of blood; tumour right flank; irrigating fluid obstructed. *Operation:* Reduced by finger in abdominal cavity till caecum reached; bowel brought out and reduction completed by pinching and traction; caecum much indented and infiltrated; caecal, ileo-caecal type. Death in fifty-five hours.

Case 20.—Male, aged 9 months, May 22nd, 1909. Ill for five days; passage of blood from bowel for three days; rigidity of abdomen, and violent screaming for one day; sausage-shaped tumour across upper abdomen to left hypochondrium. *Operation:* Partial reduction by external manipulation; caecum brought out and reduction completed by pinching; ascending colon and caecum infiltrated and stiff, and dimple present on outer side of caecum; caeco-ileo-caecal type. Recovery.

Case 21.—Male, aged 8 months, August 21st, 1909. Duration of illness not recorded; tumour reached splenic flexure. *Operation:* Manipulation reduced as far as hepatic flexure; bowel brought out; reduction completed by pinching, last inch being hindered by "band" stretching from medial side of colon outwards to right flank, and which required division; enlarged ileo-colic gland. Appendix not congested; ileo-caecal valve infiltrated. Fixation of colon by the "band" indicated intussusception largely ileo-colic type. Death in forty-eight hours, very suddenly. *Post mortem:* Negative findings.

Case 22.—Male, aged 1 year and 11 months, April 24th, 1911. Six hours' crying; three hours later blood per anum, and severe straining; abdominal facies; round mass, 2 in. diameter, behind right rectus, at level of umbilicus. *Operation:* Injection caused swelling largely to disappear; unreduced ileo-caecal intussusception found, and reduced with difficulty by pinching and traction. Recovery.

Case 23.—Male, aged 8 months, May 20th, 1911. Severe pain; bilious vomiting; blood per anum, duration not recorded; sausage tumour right hypochondrium. Reduction by fluid and external palpation. Laparotomy confirmed reduction, and showed dimple in outer pouch of caecum; caeco-ileo-caecal type. Recovery. Similar attack three months previously.

Case 24.—Male, aged 5 months, December 17th, 1911. Nineteen hours' crying and pain; enema returned bloody; resistance behind lower part right rectus; rectum negative. *Operation:* Pinching and traction on very tight intussusception caused tear of sheathing bowel; ileo-ileal type, with Meckel's diverticulum forming apex. Death in four and a half hours from shock.

Case 25.—Male, aged 6 months, April 16th, 1912. Blood per anum for sixteen hours; swelling behind left rectus, apex per rectum. Partly reduced by injection. *Operation* showed ileo-colic, ileo-caecal type, tightly jammed; peritoneum tore in places during reduction, and last inch difficult (ileum through valve). Death in twenty-four hours.

Case 26.—Male, aged 4 months, May 2nd, 1912. Twenty-three hours' screaming; nineteen hours later, very bloody stool; tumour doubtfully palpable. Injection failed to enter. *Operation* showed egg-sized lump ileo-caecal region; partly reduced by pinching, then brought out and found ileo-caecal completely reduced; 1 in. ileo-colic reduced by further pinching. Recovery.

Case 27.—Male, aged 8 months, May 2nd, 1912. Symptoms and duration not recorded. Injection *plus* manipulation through abdominal wound effected reduction; caecum brought out and found completely reduced without signs of type of intussusception; enlarged mesenteric glands. Recovery.

Case 28.—Female, aged 8 months, May 13th, 1912. Ten hours before operation began to cry; six hours later vomiting, and blood and mucus per anum; pinched appearance, with flaccid abdomen, and mass left iliac region, three hours later. *Operation:* Injection caused mass to disappear, but on opening abdomen mass found in transverse colon, and then manipulated back to hepatic flexure, where traction was necessary; last part to be reduced was ileal, very tight, about eight inches above ileo-caecal valve; type ileo-ileal, ileo-colic, ileo-caecal. Recovery.

Case 29.—Male, aged 1 year, June 2nd, 1912. Vomiting for two and a half hours, and blood and slime per anum; vertical mass right flank. *Operation*, after large injection, showed empty caecum, and ascending colon containing mass which reduced by traction. Sheath was lower three or four inches of ileum, and type was ileo-ileal, then ileo-colic. Enlarged glands at ileo-caecal junction and inner side ascending colon. Recovery.

Case 30.—Male, aged 10 months, June 25th, 1912. Nineteen hours previously awoke crying and vomiting; normal motion; two hours later blood in napkin, and twice again. Under $CHCl_3$ mass in lower epigastrium, especially in right side; manipulated into caecal region; saline injection returned bloody. *Operation:* Ecchymosed appendix fished out; then ileo-colic intussusception, apex two-thirds up the ascending colon. After reduction apex represented by dimple four inches from lower end of ileum; type was ileo-ileal, ileal-colic, ileo-caecal. Recovery.

*Case 31.**—Male, aged 10 years, June 27th, 1912. Eight days previously vomiting and severe pain for a few hours. Five days later recurrence, with melaena; hard mass behind right rectus, at appendix level. *Operation* showed intussusception into lower ileum, and extending about six inches into ascending colon; gangrenous patch on lip of sheath; resection and anastomosis. Death in a few hours from shock. Apex formed by an invaginated Meckel's diverticulum, and type was ileo-ileal, ileo-colic.

Case 32.—Female, aged 1 year and 9 months, September 22nd, 1912. Pain and passage of blood previous day, and succeeded by normal motion; recurrence of bloody motions; no swelling palpable. *Operation* showed much wrinkled lower ileum of grey colour; wall thinned 1½ in. up from termination, and appearance of having been intussuscepted for 3 to 4 in.; appendix kinked by old adhesions. Death in twenty-four hours. Case evidently of ileo-colic type, which had undergone *spontaneous reduction.*

Case 33.—Male, aged 4 months, October 25th, 1912. Crying, and blood per anum, for six hours; tumour low down behind left rectus; apex in rectum; swelling disappeared on irrigation and manipulation under $CHCl_3$. *Operation* showed mass unreduced in subhepatic region; reduced and brought out; dimple in caecum, outer pouch; great congestion of colon. Type was caecal, ileo-caecal. Recovery.

Case 34.—Male, aged 2 years and three months, February 27th, 1913. Diarrhoea for one week; abdominal pain, bilious vomiting and bloody motions for fourteen hours. $CHCl_3$, tumour left flank. *Operation* showed terminal part of transverse colon intussuscepted and reaching beyond splenic flexure; easy reduction; extravasation in mesentery. Result not recorded. Type, colo-colic.

Case 35.—Female, aged 3 years and four months, June 20th, 1913. Since previous day, pain, vomiting, and passing mucus and blood per anum; mass in left flank, and apex high up in rectum. Irrigation no effect; external manipulation reduced from rectum. *Operation* permitted of manipulation up to splenic flexure; apex in transverse colon proximal to splenic flexure, and easily reduced. Recovery. Colo-colic type, with very mobile descending colon and sigmoid flexure.

Case 36.—Male, aged 7 months, February 13th, 1914. Four days' vomiting and diarrhoea, and traces of blood in stools; lump felt on fifth day; apex within anus. $CHCl_3$, reduced by external manipulation into right iliac region. *Operation* showed caecum and appendix visible; above was unreduced subhepatic invagination of colon wall; mobile ascending colon, with ileo-colic mesentery; dimple present in caecum, and in outer side of commencement of ascending colon. Recovery.

B. ANALYSIS.

Analysis of the cases above recorded yields information on the following points:

Sex.—Males, 28 (77.7 per cent.); females, 8 cases.

Age.—Under 1 year, 24 cases (66.6 per cent.), the average being 6.15 months; 1 to 2 years, 5 cases; 2 to 3, 3 to 4, 4 to 5, and 5 to 6 years, 1 case each; 10 years, 2 cases; and 70 years, 1 case.

Symptoms.—Abdominal pain, evidenced by screaming and by spasm of the abdominal muscles, was noted in 25; vomiting in 21; the passage of blood per anum in 30; localized sausage-shaped swelling on palpation of the abdomen in 31 cases. The apex of the intussusception was felt per rectum in 9 cases.

Operation.—Twenty-four cases were operated upon in the course of the first day of the symptoms, the periods ranging from two and a half hours to twenty-four hours, with an average of sixteen hours; 9 were operated upon after the first day, the periods ranging from two to fourteen days, the average being four and a half days; in 3 the period was not recorded. As regards operative procedure, in the early cases of the series laparotomy and manipulation was the method employed. Later the operative procedure gradually evolved into the following routine: A general anaesthetic ($CHCl_3$) was administered. If there was a palpable sausage-shaped swelling present, taxis was tried. Unless the swelling was reducible with

* For details, vide *Proceedings*, Roy. Soc. Med., vol. xiv, 1921.

General Table.

No.	Sex.	Age.	Duration of Symptoms.	Result.	Remarks.	Type.
1	M.	4 mos.	48 hours	Death	20 hrs. later	Ileo-caecal.
2	M.	18 mos.	60 ,,	Death	6 hrs. later; resection	Ileo-ileal; Meckel.
3	M.	4 mos.	24 ,,	Recovery	—	Ileo-colic.
4	M.	3 mos.	5 ,,	Recovery	Enlarged glands	Ileo caecal.
5	M.	5½	7 days	Death	2½ hrs: resection	Ileo-ileal.
6	M.	70	24 hours	Recovery	—	Ileo-caecal.
7	M.	18 wks.	16 ,,	Recovery	Retarded by gastro-enteritis	Ileo-caecal.
8	F.	21 mos.	48 ,,	Death	36 hrs. later; resection	Ileo-ileal, ileo-colic.
9	M.	2 mos.	20 ,,	Death	12 hrs. later; resection	Ileo-caecal.
10	F.	10 yrs.	14 ,,	Death	15 hrs. later; resection	Ileo-ileal.
11	F.	7 mos.	4 ,,	Death	48 hrs. later	Ileo-colic.
12	M.	10 mos.	8 ,,	Recovery	—	Caeco-ileo-caecal.
13	M.	4 yrs.	24 ,,	Recovery	—	Colo-colic.
14	F.	5 mos.	19 ,,	Recovery	Enlarged glands	Colo-colic.
15	M.	7 mos.	26 ,,	Recovery	—	Ileo-ileal, ileo-colic, ileo-caecal.
16	M.	5 mos.	68 ,,	Death	22 days later; gastro-enteritis	Caeco-ileo-caecal.
17	M.	4 mos.	24 ,,	Recovery	—	Ileo-colic.
18	M.	5 mos.	21 ,,	Recovery	—	Ileo-caecal.
19	M.	4 mos.	16 ,,	Death	55 hrs. later	Caeco-ileo-caecal.
20	M.	9 mos.	3-5 days	Recovery	—	Caeco-ileo-caecal.
21	M.	8 mos.	—	Death	48 hrs. later; enlarged glands; band across colon	Ileo-colic, ileo-caecal.
22	M.	23 mos.	6 hours	Recovery	—	Ileo-caecal.
23	M.	8 mos.	—	Recovery	—	Caeco-ileo-caecal.
24	M.	5 mos.	20 hours	Death	4½ hrs. later	Ileo-ileal; Meckel.
25	M.	6 mos.	17 ,,	Death	24 hrs. later	Ileo-colic, ileo-caecal.
26	M.	4 mos.	23 ,,	Recovery	—	Ileo-colic, ileo-caecal.
27	M.	8 mos.	—	Recovery	Reduced before bowel brought out of abdomen	Not discovered.
28	F.	8 mos.	10 hours	Recovery	—	Ileo-ileal, ileo-colic, ileo caecal.
29	M.	1 yr.	2½ hours	Recovery	—	Ileo-ileal, ileo-colic.
30	M.	10 mos.	19 ,,	Recovery	—	Ileo-ileal, ileo-colic, ileo-caecal.
31	M.	10 yrs.	3 days	Death	24 hrs. later resection	Ileo-ileal, ileo-colic; Meckel.
32	F.	21 mos.	24 hours	Death	24 hrs. later	Ileo-colic.
33	M.	4 mos.	6 ,,	Recovery	—	Caeco-ileo-caecal.
34	M.	27 mos.	14 ,,	—	—	Colo-colic.
35	F.	39 mos.	24 ,,	Recovery	—	Colo-colic.
36	M.	7 mos.	5 days	Recovery	—	Caeco-colic.

light taxis, saline fluid was run into the rectum from a height of 1 to 2 ft. The body was held up by the lower limbs during the injection, and when the fluid ceased to run in or was beginning to be ejected the tube was withdrawn and the buttocks were forcibly approximated. Taxis was repeated during and after the injection of the fluid. In some cases the saline very considerably reduced the swelling; but usually manipulation was required in addition. After reduction had been carried as far as possible, *laparotomy* was performed through the right rectus, with the mid-point of the incision at the level of the umbilicus. Pinching by the fingers in the abdominal cavity still further reduced the mass, till the caecum was reached. It was generally found necessary to bring out the caecum in order to complete the reduction, the last part being usually very tight and difficult. The bowel was then inspected for signs of gangrene, tumour, or abnormality; dimpling of the caecum, if present, was rectified, and the parts were then returned into the abdomen. Through-and-through silkworm-gut sutures were employed to close the abdominal wound, but were not tied till the peritoneum had been closed by continuous catgut suture. Even if apparently complete reduction had been obtained by injection and external manipulation, laparotomy was always performed in order that the parts might be inspected; and the results showed that very seldom indeed had complete reduction been effected by non-operative treatment. A sedative (nepenthe) was usually necessary shortly after the operation; and a small dose of castor oil was administered within twenty-four hours, with the object of forestalling or lessening toxic absorption from the bowel.

Anatomical Types.—The cases presented marked differences in their anatomical details, varying from simple to complex. In the following classification an endeavour is made to indicate the main types found at operation and their relative frequency.

1. *Ileo-caecal*, 7 cases (19.4 per cent.). Cases 1, 4, 6, 7, 9, 18, and 22. In this type the ileo-caecal valve forms the apex of the intussusceptum, and there is more or less invagination of the caecum and colon. Allied to this type, and possibly included with it by some writers, is

1a. *Caeco-ileo-caecal*, 6 cases (16.6 per cent.). Cases 12, 16, 19, 20, 23, and 33. In this type the wall of the caecum is found to be thickened and oedematous; and it is also found that, after complete reduction of the ileum and ileo-caecal valve, the outer pouch of the caecum presents a marked dimple. This depression is situated between the anterior and postero-external taeniae, and requires for its reduction firm pinching of the oedematous wall of the bowel. The appearances suggest that the lateral pouch has formed the apex of the intussusceptum; but, even if this be so, the ileo-caecal valve is not far behind it, and the type might quite fairly be included with the ileo-caecal variety proper. This would give us in the present series an aggregate percentage of 36.

2. *Colo-colic*, 5 cases (13.88 per cent.). Cases 13, 14, 34, 35, and 36. In three of these the transverse colon was the seat of intussusception; in two (14 and 36) intussusception seemed to have begun in the ascending colon.

3. *Ileo-colic*, 4 cases (11.1 per cent.). Cases 3, 11, 17, and 32. The apex is formed by the invagination of the ileum through the ileo-caecal valve, and the caecum and ascending colon remain in their normal situation in the abdomen. In Case 32 the intussusception had been completely and (?) spontaneously reduced before the abdomen was opened; but the appearance of the wall of the ileum showed that it belonged to this type.

4. *Ileo-ileal*, 4 cases (11.1 per cent.). Cases 2, 5, 10, and 24. In these cases there was strangulation of the bowel, and all died. Three of the cases required resection. Two presented a Meckel's diverticulum, and in one of them (24) this was evidently the source of the intussusception. Of the four cases, one was aged 5 months; the others were 18 months, 5½ years, and 10 years respectively—well above the average age of 6 months.

Of the remaining cases, 9 were examples of combinations of two or more of the preceding types.

5. *Ileo-colic, ileo-caecal*, 3 cases (8.33 per cent.). Cases 21, 25, 26. In these the intussusception began as the ileo-colic type. The protruding ileum was subsequently accompanied by the ileo-caecal valve, and so involved invagination of the caecum and colon. The reduction of the portion of ileum which had prolapsed through the ileo-caecal valve was only effected at the last and with difficulty.

6. *Ileo-ileal, ileo-colic*, 3 cases (8.33 per cent.). Cases 8, 29, and 31. Beginning as ileo-ileal, the invaginated bowel progressed through the ileo-caecal valve. It was found at operation that the sheathing bowel was the lower ileum. The first case had had symptoms for forty-eight hours and gangrene of the bowel had ensued; resection was performed with fatal result. The second case was operated upon within three hours of onset, and reduced by traction. The third case was not operated upon till the third day, gangrene had resulted, and death followed in a few hours after resection and anastomosis. In this case the apex had been formed by an invaginated Meckel's diverticulum.

7. *Ileo-ileal, ileo-colic, and ileo-caecal*, 3 cases (8.33 per cent.). Cases 15, 28, and 30. As the name indicates, the intussusception is first of all of the ileo-ileal type, progressing to ileo-colic, and finally carrying the ileo-caecal valve along and invaginating the caecum and colon. All three recovered, although, as can be readily understood, the reduction in this variety of case entailed a good deal of manipulation.

8. *Not determined*: 1 case (27) was reduced before laparotomy and when the bowel was inspected there were no indications of the type to which the intussusception had belonged.

Gangrene.—Gangrene had occurred in 6 cases (2, 5, 8, 9, 10, and 31). In these cases, with the exception of 9, the intussusception was of the ileo-ileal type, and in two (8 and 31) had progressed to ileo-colic.

It has to be remembered that in the ileo-ileal type the entering layer is tightly packed into bowel of a diameter similar to its own. On physical grounds, therefore, the compression of the entering and distension of the returning and sheathing layers would be abnormally great and the blood supply correspondingly endangered. With the exception of 9, in which the duration of symptoms was twenty hours, the element of time had also to be reckoned

with. In the remaining five cases the symptoms had lasted for 2, 2½, 3, 7, and 10 days respectively. In Case 9, although of the ileo-caecal type and of comparatively short duration, the different layers of bowel were so firmly caught that the colon tore on manipulation (pinching and traction). In all six resection was performed and in all with fatal results. The sheathing bowel was affected in five cases, and in one of these the entering bowel was also gangrenous; in the sixth case there seemed to be generalized gangrene of the parts implicated in the intussusception.

Etiology.—The operative findings threw very little light on the etiology of the condition. With the exception of a Meckel's diverticulum in two cases (24 and 31), there were no visible indications of what had caused the intussusception. In two other cases (35 and 36) there was a mobile colon; and enlarged glands were noted in Cases 4, 14, 27, and 29. The remaining 28 cases showed nothing abnormal. It is doubtful what effect, if any, the above-mentioned conditions exerted in the production of the intussusception, and we are, I fear, thrown back on the hypothesis of disordered peristalsis of obscure origin.

Results.—In the 35 cases in which the result was recorded there were 21 recoveries (60 per cent.) and 14 deaths (40 per cent.). In recording results the *duration of symptoms prior to operation* must always be taken into account. The relationship of result to time of operation is shown in the following table:

Period of Operation.	Numbers.	Recoveries.	Deaths.	Not Recorded.
First day	24	16	7	1
After first day ...	9	3	6	—
Not recorded ...	3	2	1	—
Totals	36	21	14	1

Reference to the general table and to this shows recovery in 7 cases operated upon within twelve hours of the onset of symptoms; in 9 the period was twelve to twenty-four hours; in 3 over twenty-four hours; and in 2 the period was not recorded. The period in recovery cases varied from two and a half hours to five days.

In one of the deaths the period was under twelve hours; in 6 the period was twelve to twenty-four hours; and in 6 it was over twenty-four hours. In one case the period was not recorded. The period in fatal cases varied from four hours to fourteen days.

These figures undoubtedly support the general view as to the value of the time element in estimating results; but they also show that time is not all-important.

In three cases (2, 5, and 24) death occurred within a few hours after operation, and apparently resulted from shock. One case (16) died on the twenty-second day from gastro-enteritis. The remainder ranged from twelve to fifty-five hours, giving an average of 31.3 hours after operation. Death was usually preceded by a rapid rise of temperature to 102° or 103° F., and the facies (pallor, sunken eyes) was that of toxaemia.

The following figures show the *relationship of death to anatomical type:*

Ileo-caecal	7 cases	2 deaths.
Caeco-ileo-caecal	6 ,, ...	2 ,,
Colo-colic	5 ,, ...	0* ,,
Ileo-colic	4 ,, ...	2 ,,
Ileo-ileal	4 ,, ...	4 ,,
Ileo-colic, ileo-caecal ...	3 ,, ...	2 ,,
Ileo-ileal, ileo-colic	3 ,, ...	2 ,,
Ileo-ileal, ileo-colic, ileo-caecal	3 ,, ...	0 ,,
Type not recorded	1 ,, ...	0 ,,

* Result in one case not recorded.

Conclusions.

Consideration of the various points illustrated by the above series of cases would lead to the following conclusions:

1. Marked preponderance in males; frequency three and a half times as great as in females.
2. Majority (68 per cent.) of cases occurred in the first year, and of these the average was 6.15 months.
3. More than one-third of the cases were of the ileo-caecal (including caeco-ileo-caecal) variety.
4. Visible proof of etiology was not found at operation.
5. Death rate (40 per cent.) largely depended on length of interval before operation, and, secondary to this, on gangrene; it was highest in ileo-ileal cases.
6. Resection gave invariably fatal results.

DISCUSSION.

Mr. MCADAM ECCLES said that with regard to the causation of intussusception it was important to remember that the internal muscular coat of the small intestine in particular was rather spiral than circular, and that when irregular peristalsis occurred the distal portion of the ileum became cone-shaped, so as easily to slip through the ileo-caecal valve. With regard to operation, for success it should be performed early and with as much promptness, not hurriedness, as possible.

Mr. F. J. S. HEANEY (Liverpool) pointed out that the rigidity of the parts concerned in the intussusception on account of oedema was an insurance against immediate recurrence.

Mr. E. W. G. MASTERMAN (London) referred to a case of a boy of about 10 in whom, it being impossible to reduce an intussusception and the general condition being unfavourable to resection, he did a lateral anastomosis above and below the intussusception. The patient made a complete recovery. Although this was not a recognized orthodox method, it might in suitable cases be a more hopeful alternative to complete resection, in view of the very high mortality of the latter.

Mr. ARTHUR COOKE expressed surprise that in the opener's list of thirty-six cases only two were traced to Meckel's diverticulum, as he had had two cases where this cause was operative out of three consecutive cases. He considered that excision of gut was looked upon with too great gravity, and quoted a case where excision of 27 inches of intestine was followed by normal recovery. The presence or absence of toxaemia was the governing factor.

Dr. D. G. GREENFIELD (Rushton) said that the importance of the diagnosis before the operation of blood and mucus passed per rectum had to be recognized. He had recently observed two cases very early after the apparent occurrence of the intussusception, and a notable feature was extreme pallor of the patient, lasting for a few moments at a time, recurring at intervals of a few minutes, amounting almost to collapse in each instance. He thought that if this sign was definitely observed operation might be proceeded with without waiting for the usual classical evidences of intussusception.

Mr. CHILDE (Portsmouth) said that, in regard to prognosis, broadly put the matter could be stated thus: If operation were undertaken early and reduction effected with comparative ease the patient recovered; if operation were delayed so that resection was necessary, the patient invariably died. He recommended the bimanual examination with one finger in the rectum, and the other hand on the abdomen under an anaesthetic. Like many other surgical conditions early diagnosis and early operation were called for.

THE BEST METHOD OF OPERATIVE APPROACH IN CASES OF ACUTE APPENDICITIS.

BY

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IT may be said by some that the consideration of the best method of the operative approach, when dealing with cases of acute appendicitis, merely resolves itself into a question of a particular surgical technique, just a matter of surgical handicraft, as it were, because so many methods and such a multitude of incisions have been advocated from time to time. This, however, is not my view, and it seems to me that, given a case which with some confidence a surgeon is able to diagnose as acute appendicitis, there is probably a method which, on the whole, is the best in the interests of the patient, and should, therefore, be adopted. It is only because I am firmly convinced that the route taken by the surgeon may make, in many cases, all the difference between life and death to the patient

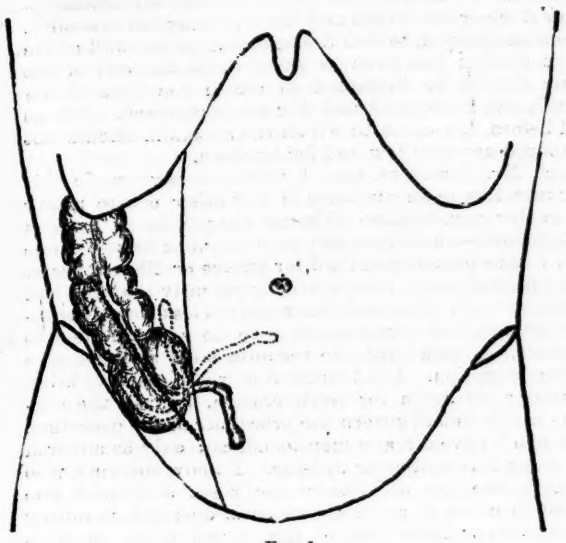

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

FIG. 13.

FIG. 14.

Description of Illustrations.

FIG. 1.—Variations in position of appendix. Right semilunar line shown. Heavy dotted line indicates line of incision. There is nothing original in the position of this incision. It is practically the same as McBurney himself recommended many years ago.

FIG. 2.—The skin and fat are divided and the external oblique exposed, partly muscular and partly tendinous.

FIG. 3.—The external oblique is divided and the internal oblique exposed. Some surgeons would now split the internal oblique and the transversalis in the line of their fibres. A gridiron incision is not a suitable one for cases of acute appendicitis; a far better view is obtained by dividing these muscles in the same line as used for the external oblique.

FIG. 4.—The internal oblique and transversalis are divided and the peritoneum exposed. The subperitoneal tissue is often found infiltrated with exudate.

FIG. 5.—The peritoneum is divided and the caecum is exposed. Even when this stage is reached there may be no indication as to the position in which the appendix is lying.

FIG. 6.—The lower and inner part of the wound is retracted, and part of the appendix is seen swollen and deeply congested and hanging down into the pelvis. Some adjacent coils of small intestine are seen. The omentum is not represented in any of the illustrations, nor is any peritoneal exudate.

FIG. 7, see p. 396.

FIG. 8.—The outer part of the wound is retracted, and the appendix is seen swollen and inflamed on the outer side of the caecum. Before the abdomen is opened it may be quite impossible to tell with any certainty whether the appendix is on the inner side, beneath, or on the outer side of the caecum. In such a case as this, if a semilunar line incision is used, healthy omentum or small intestines will very likely appear when the peritoneum is opened, and must be pushed aside before the infected area is reached. Through the oblique incision recommended these two structures may not be seen at all.

FIG. 9.—Operation on a young woman of 20 with acute appendicitis in which the usual incision revealed only a coil of small intestine in the iliac fossa. The incision was extended upwards, and the appendix was found inflamed and adherent to the front of the colon, as represented in the illustration. The caecum had not descended. The illustration demonstrates how extremely inappropriate a mid-line, or even a right semilunar line incision, would have been in this case, but how easy it was to deal with the unusual condition found by extending upwards and outwards the oblique incision made over the iliac fossa.

FIG. 10.—Commencing closure of the wound. A tube is placed at the lower and inner angle of the wound and extends to the bottom of Douglas's pouch. This is a case in which a collection of pus has been found in the pelvis, and the surgeon considers that drainage is necessary. The peritoneum and subperitoneal tissues are united with interrupted catgut sutures. For this layer and for the suturing shown in the subsequent illustrations many surgeons would use a continuous suture.

FIG. 11.—The transversalis and internal oblique are sutured.

FIG. 12.—The external oblique is sutured.

FIG. 13.—The skin is sutured. In many cases in which there is no large collection of pus the wound may be united completely without the employment of drainage.

FIG. 14.—In many cases in which the appendix is lying on the outer side of the caecum the only collection of pus found is in the right flank, and in these it may be best to close completely the original wound and to drain by a separate stab puncture in the loin, as seen in the illustration.

that I am bringing this matter forward for consideration by this Section to-day. Successful results in operating on acute appendicitis can, of course, be obtained by many methods, and it is probable that the man behind the method is the most important factor of all.

I am well aware that it is impossible in many cases for the surgeon to be confident of the exact condition he will find when it is his duty to open the abdomen of a patient who has been in perfect health two or three days previously, and in whom it is evident that a very grave intra-abdominal condition has arisen. There is more than one abdominal viscus which is liable to sudden derangement of function, and the early symptoms may not enable the surgeon to decide which viscus is at fault. Under these circumstances most of us would choose an incision in or near the mid-line of the abdomen, because the operation is an exploratory one, an accurate diagnosis not being possible; and although such an incision may be a wise one under the circumstances, I do not think it is at all a good one if the case turns out to be one of acute appendicitis.

The method, therefore, which I recommend to-day is one which I have found the best for cases of acute appendicitis in the first few days of the illness, and in which the surgeon can be reasonably confident of the correctness of his diagnosis. The method does not so much apply to a case to which the surgeon may not have been called until the patient has been ill for ten to fourteen days, not nearly so common a condition of affairs at the present time, by the way, as it was twenty years ago, and when there may be a pint or two of pus in the abdomen.

There are to my mind certain governing conditions of fundamental importance which should be remembered when an operation on a case of acute appendicitis is undertaken, and some of them are:

1. That the shortest route should be chosen to the infected area, and the fullest possible view obtained of it, to enable the surgeon to deal adequately with the extent of the infection found.

2. That the intestines and the other abdominal viscera around this area should be disturbed as little as possible, but with the reservation that the treatment of the infection must be efficient. I believe that it is of vital importance that these cases should be dealt with by following the disease where it leads, and with the minimum disturbance of other abdominal organs in the neighbourhood.

FIG. 7.—Reproduced from Kelly's classical work, *The Vermiform Appendix and its Diseases*. The appendix is seen hanging down into the pelvis with its tip disappearing into a pool of pus. The advisability of opening such an abscess by a separate mid-line incision or through the rectum or vagina is considered in the text.

3. That the operation should be performed as rapidly as possible, but again with the same reservation as in 2. The late Dr. Murphy told us that in these cases we must get in quickly and get out quickly, and this is advice which we should all remember.

4. That in all cases, with very few exceptions, the appendix should be removed. If a surgeon wants to cure a patient with acute appendicitis within a reasonable time the appendix must be removed. There are two cases in Norwich at the present time in each of which I opened a large abscess nearly a year ago, and both are still draining. It may be objected that in the search for the appendix existing adhesions will be disturbed, healthy peritoneum will be opened up, resulting in spread of the infection. In my view the result depends on how the search is conducted. If adhesions are widely separated in many directions the area of the infection may be extended, but if careful separation is carried out, beginning at the end of the caecum, where the base of the appendix must be, the patient will not be put in grave danger. In my opinion the danger has been greatly exaggerated, and, furthermore, the risk of a septic focus in the abdomen and a discharging sinus persisting for months, due to an unremoved appendix, is by no means to be disregarded. A septic pylephlebitis has not infrequently been set up by an old focus due to appendix trouble, and after this complication has arisen I know no medical or surgical means of combating it. If the surgeon be called to a patient who has been ill for a long time, and is in a critical condition from septic absorption, or if he or she be old and feeble, it may be impossible, in the time allowed, to find the appendix in the wall of the abscess cavity; but even in these cases the end of the caecum should be inspected to see if the base of the appendix can be exposed and the organ removed. But, as I said before, the cases in which the appendix should not be removed are very few and far between.

I feel, Mr. President, that I ought to have made this communication to an audience in any other centre rather than in this city, because although the particular incision recommended—an oblique one over the iliac fossa—is one which I have myself practised for twelve or fifteen years, I was not aware until comparatively recently that you had yourself strongly advocated this route not less than twenty-five years ago, and have continued to do so from time to time since. Others have also recommended an incision in the same situation. But I think it is worth while to bring the matter up again for consideration, because the conditions which should govern the procedure of the operation, and which I have already mentioned, can only be adhered to by using this particular incision. I know surgeons who habitually use the mid-line or the right semilunar line incision in cases of acute appendicitis operated on during the first two or three days of illness, and these incisions I would strongly urge are not the best to use under the circumstances.

Now the first of the four conditions alluded to above and which I deem to be of such importance—namely, "that the shortest route be chosen to the infected area and the fullest possible view should be obtained of it," leads me at once to the consideration of the anatomy of this region. The illustrations are home-made products, and in making them I have endeavoured to show roughly what I myself see at these operations, leaving out unessential details.

There are one or two points worth considering in connexion with the operation itself. If the appendix is not seen quite early in the operation, I believe it is a good thing to retract the lower and inner part of the wound, and to see if the appendix is hanging over the pelvic brim—a very frequent position and one which usually is associated with a collection of pus in the pelvis. Even if the appendix is found in the iliac fossa with only a drachm or so of pus around it, there may be an unsuspected collection of some ounces of pus in the pelvis which has trickled down in a narrow stream. Unless the pelvis is explored in these cases this collection may be overlooked, and I believe that some of the cases of acute appendicitis which have apparently improved for a day or two after the appendix, found lying in the iliac fossa perhaps on the outer side of the caecum, has been removed, but have died subsequently at the end of about a week with signs of generalized peritonitis, may be instances in which an unsuspected pelvic collection of pus has been left behind.

To drain a pelvic collection (Fig. 7) some surgeons are in the habit of making a separate mid-line puncture just above the pubis, even when the original incision has been over the iliac fossa. I do not believe that this is ever necessary. If the collection in the pelvis needs drainage it can be just as efficiently secured by a tube put into the pelvis at the inner end of the oblique incision recommended.

Opinions as to the best method of draining a collection of pus in Douglas's pouch, the result of acute appendicitis, vary. Some surgeons open these through the vagina or rectum. This method has the advantage of dependent drainage. Some will drain by one of these routes although there is also an opening above through which the abscess has been opened. I am well aware of the fact that when such an abscess has burst spontaneously through the

rectum the patient's symptoms have subsided and the patient has apparently recovered, but how long does the discharging track into the rectum persist after the patient is apparently quite well?

I do not believe that this drainage through the rectum or vagina is necessary or desirable. Drainage through the abdominal incision is all that is required, and although Nature may evacuate an appendicular abscess per rectum, that is no reason why we should adopt her route if we know of a better.

An objection may be raised that this method of operating severs many muscular fibres, and so is liable to cause a ventral hernia. When it has been possible to close the wound completely after removal of an inflamed appendix and the wound has healed by first intention, I have never known a hernia to develop. If it is necessary to insert a tube, then the tube track is, of course, a weak spot in the abdominal wall, and a hernia may result. But the possibility of this sequela is of no importance whatever in view of the urgent condition of the patient, which should override every other consideration. Furthermore, a hernia in this situation is the easiest one in the body to cure by a secondary operation.

I hope that I have demonstrated to you that when the caecum is on the right side of the abdomen an appendix in any position can be removed through the incision I have advocated. By an extension of the wound down and in, the appendix hanging down into Douglas's pouch can be sought for and removed and the pelvis drained. By an extension up and out the appendix can be exposed when it is lying just below the liver, and through the middle of the incision the appendix in intermediate positions can be dealt with. This incision also offers the easiest method of approach whereby the surgeon can, by his operation, fulfil the conditions named at the commencement of this paper.

DISCUSSION.

Mr. HAMILTON RUSSELL (Melbourne) did not think that Sir H. Ballance's advice to sever the internal oblique and transversalis fibres transversely could be sound. It was quite true that if they were accurately brought together, and if then healing without suppuration occurred, no hernia would result, and all would be well. But if the wound suppurated, or if a tube had to be used, hernia was practically certain to supervene. In the great majority of cases ample room could be obtained by the muscle-splitting method. One had as further resources (1) to extend the muscle opening into the rectus sheath; and if that was still insufficient, to (2) incise the muscles transversely in one-half of the exposed area only, subsequently bringing all the muscle so incised into accurate apposition, and so practically reconverting the case into the muscle-splitting method.

Mr. RUSSELL COOMBE (Exeter) disagreed entirely with the suggestions made by the writer of the paper in regard to the incisions. His preference was for incision just within the semilunar line, which had proved invariably satisfactory in his hands and had not resulted in hernia. If drainage were necessary it was easily accomplished through the lower end of the incision.

Mr. E. W. G. MASTERMAN (Camberwell, London) wished to refer to two points. First, with regard to the site of the incision, he agreed with the last speaker that for suppurating appendicitis—which formed the great proportion of his cases—an incision along the outer edge of the rectus was much to be preferred to an oblique incision. He reserved the "gridiron" incision for cases in which he did not expect to have to drain. He could not at all agree with the method of cutting across the fibres of the transversalis muscle, especially in cases needing drainage. Ventral hernia was far more likely to follow an oblique incision than one in the semilunar line. The second point was the removal of the appendix. It would be a mistake to make too absolute a rule about this. Some cases, especially retrocaecal ones with many adhesions, were very difficult to remove, and although those who, like Sir Hamilton Ballance, doubtless had a very low percentage of cases in which this was not done, younger surgeons, who had less experience, would be wiser not to spend too much time over efforts at removal which might by greatly prolonging the operation seriously imperil the patient's chances. Many cases where the appendix was left got quite well, and if necessary the appendix could be removed under more favourable conditions at a subsequent operation.

Mr. H. S. SOUTTAR considered that a muscle-splitting incision at McBurney's point was best for all cases of appendicitis. By extending the split in the internal oblique and transversalis into the rectus sheath, and then downwards towards the pubes, a large triangular flap is mobilized, giving the freest access to the whole of that region of the abdomen.

Mr. MCADAM ECCLES said: The one point is a free exposure of the infected area, with as little damage as possible to the overlying parts. I would say, never open the rectus sheath when operating for acute infection of the appendix; always keep on the outer side of the rectus. Never cut the internal oblique and transversalis muscles; separate their fibres. Never cut the anterior branch of the eleventh thoracic nerve, which is apt to be cut when the muscle fibres are divided. I have seen quite a number of cases of right inguinal hernia develop within a year of the primary operation, when the appendix scar is sound.

Mr. MARCUS MAMOURIAN (Ashton-under-Lyme) advocated the gridiron incision. He found that it was best to cut the internal oblique in the line of its fibres with a sharp knife, and not to separate them with a blunt-pointed instrument.

Sir HAMILTON BALLANCE, in his reply, said that he could not justify an operation through an incision big enough to admit only two fingers. He wanted to see the area of operation. He agreed that hernia frequently resulted if a tube had been used, as obviously a weak spot was left in the scar, but it was a hernia easy to cure. With increasing experience the number of appendices left behind in an operation in the acute stage was becoming smaller.

DEMONSTRATION.

THE following are short notes of the cases demonstrated by Professor RUTHERFORD MORISON in the War Pensions Hospital, illustrating (1) the bipp method of treatment of infected wounds; (2) the treatment of bone cavities, especially dealing with fat grafts; (3) the value of Lane's plates in certain bone graft operations. Professor Rutherford Morison showed cases illustrative of a new principle in surgery—namely, that if an infected wound or an abscess be treated by operation and the thorough application of suitable antiseptics it may heal, regardless of the variety of infection, by "first intention." He did not regard the bipp method as the last word to be said on this subject, but meanwhile it was the best he knew, and the results obtainable were surprising.

Bone Cavities.

This method had made it possible to treat bone cavities by filling them with fat grafts and closing them up with success. This was a matter of national importance. The chief difficulty was to get the bone cavity and fat covered by healthy skin. If this could be done, healing by "first intention" followed a satisfactory operation. If fat was exposed healing was much delayed, but the grafts were not extruded and with proper wound treatment would eventually become vascularized and replaced by new bone.

Case 1.—Pens. L., aged 33. Wounded August 18th, 1918: Fractured tibia. Five previous operations. Final operations (by Mr. Cuff): First operation May 29th, 1920; second operation June 22nd, 1920. Healed April 18th, 1921—ten months. Delay due to separation of skin edges and exposure of fat.

Case 2.—Pens. W. W., aged 21. Wounded September 7th, 1916: Large bone cavity in femur. Many previous operations—more than ten. Last operation July 2nd, 1920 (Professor Morison): cavity filled with fat grafts. Skin flap sloughed over cavity. Healed March 21st, 1921—eight months.

Case 3.—Pens. J. E. S., aged 21. Wounded October 9th, 1918: Fractured femur; large cavity. Ten previous operations. Last operation (Professor Morison) August 31st, 1920. Healed October 30th, 1920—two months. (Case not shown.)

Case 4.—Pens. G., aged 23. Wounded April 27th, 1915: Fractured femur; large cavity. Six previous operations; never healed. Final operations (Professor Morison):—First stage (September 16th, 1920): Cavity cleaned, bipp technique. Second stage (October 15th, 1920): Wound healed over bipped gauze; opened up; cavity filled with fat grafts. First dressing November 6th, 1920 (three weeks). Wound over cavity healed by first intention, but broke down in centre later (December 4th, 1920). Soundly healed February 14th, 1921—four months.

Case 5.—Pens. T. S., aged 25. Wounded October 4th, 1918: Fractured tibia. Seven previous operations. Last operation (Professor Morison) September 24th, 1920: Cavity filled with fat grafts. Healed April 18th, 1921 (six and a half months). Delay due to separation of skin edges and exposure of fat grafts.

Case 6.—Pens. B., aged 23. Wounded November 10th, 1918: Fracture of tibia. Twelve previous operations; at one fat grafts were used, but no bipp, and the fat suppurated out. Final operation for bone cavity October 8th, 1920 (Professor Morison): Cavity bipped and fat grafted. Some infection of wound, but insufficient to disturb exposed fat grafts. February 25th, 1921: Wound healed. March 30th, 1921: Radiant heat; scars broke down. Healed April 28th, 1921—six months.

Case 7.—Pens. D., aged 43. Wounded May, 1918. Large bone cavity in upper end of ankylosed humerus cured by muscle grafts. The case is shown specially to illustrate the difficulty of treating shoulder wounds, and partly because he is the only case we have had here showing bipp poisoning in the first degree. Operated October 21st, 1920. On October 28th bipp absorption. Not at all ill, but blue line round teeth. April 28th, 1921: Still sinuses in soft parts, but bone cavity healed long ago.

Case 8.—Pens. B., aged 43. Wounded June 2nd, 1915: Fractured tibia. Five operations since. Fat graft used at one of them, but no bipp, and fat suppurated out. Final operation for bone cavity, November 2nd, 1920 (Professor Morison). Skin flap partially sloughed, exposing fat. Still not quite healed. Small sinus. This man is in bad health from some stomach trouble, and his skin rebels against either bipp or flavine.

Case 9.—Pens. C., aged 29. Wounded April 16th, 1918: Fractured femur. Eight previous operations. Final operation for bone cavity, November 15th, 1920 (Professor Morison). The wound has alternately healed and broken down again. Was healed on April 18th, 1921, but broke down superficially eight days later. Still a small sinus.

Case 10.—Pens. McB. Wounded December 8th, 1916: Fractured femur. Twelve previous operations. Last operation November 19th, 1920 (Professor Morison). January 6th, 1921: Returned from Christmas leave all healed—seven weeks and five days.

Case 11.—Lieut. H., aged 24. Wounded April 9th, 1917: Fractured humerus. Eight previous operations. Last operation November 19th, 1920 (Professor Morison): Cavity in upper end of humerus filled with muscle graft from deltoid. Healed December 14th, 1920—twenty-five days. (Case not shown.)

Case 12.—Captain A., aged 26. Wounded August 13th, 1918: Fractured femur. Ten operations since failed to secure healing of sinus in thigh. Operation for bone cavity November 26th, 1920: Fat grafts (Professor Morison). Wound entirely healed December 20th, 1920—twenty-four days. (Case not shown.)

Case 13.—Pens. M., aged 28. Wounded July 1st, 1916, in right knee. Five operations previous to fat grafting. Last operation February 3rd, 1921 (Professor Morison). Healed February 27th, 1921—twenty-four days.

Case 14.—Pens. B., aged 28. Wounded September 26th, 1915: Fracture of right femur. Never been healed. Many operations. Discharging sinus. Numerous acute flares-up and several abscesses incised in different places. Operation February 9th, 1921 (Mr. Irwin): Muscle graft in cavity. Healed March 2nd, 1921—three weeks.

Case 15.—Pens. H., aged 28. Wounded December 20th, 1915: Fractured humerus. Sixteen operations on arm—never healed. Last operation, fat grafts, April 1st, 1921 (Professor Morison). Healed April 18th, 1921—seventeen days.

Case 16.—Pens. L., aged 23. Wounded October 25th, 1917: Fractured femur. Sixteen previous operations. Last operation for bone cavity, fat grafts, April 8th, 1921 (Professor Morison). Healed April 18th, 1921—ten days. Some serum escaped since sutures were removed. Soundly healed May 2nd, 1921—twenty-four days since operation.

Case 17.—Pens. D., aged 25. Wounded September 18th, 1916: Fractured femur. Persistent sinus. Wound healed periodically; never remained healed for more than five weeks. Seven previous operations. Last operation April 29th, 1921 (Professor Morison): Cavity in femur filled with fat grafts. (Large sequestrum removed with difficulty.) May 2nd, 1921: Dressed first time; wound looked perfect. June 10th, 1921: Small piece of loose bone felt in sinus—could not be removed. July 18th, 1921: Sinus now very small: no bone felt.

Case 18.—Pens. H. Wounded April 23rd, 1917: Fractured tibia. Never healed for more than three months. Eleven previous operations. Last operation May 12th, 1921 (Mr. Irwin): Cavity cleaned; bipp technique; combined fat and muscle graft. May 21st, 1921: Dressed. One small granulating surface centre of scar. June 9th, 1921: Wound entirely dry and healed—four weeks after operation.

Case 19.—Pens. C., aged 26. Wounded November 17th, 1917: Fractured humerus. Six previous operations. Never healed. Last operation July 8th, 1921 (Professor Morison): Cavity cleaned; bipp technique, and filled with fat grafts and one strip of deltoid. July 14th, 1921: Dressed first time (six days). All healed except small area size of little finger-nail at bottom of incision scar. Healed July 27th—seventeen days.

Bone Grafts.

Professor Morison had brought bone graft cases to illustrate the fact that repair would follow bone grafting if a Lane plate was used to fix the graft, when other methods had failed.

Case 1.—Pens. C., aged 30. Wounded April 14th, 1918. Four previous operations. Gap in humerus. Operation November 17th, 1919 (Professor Morison): Bone graft, 2 plates. Dressed December 28th, 1919. Wound opened up; graft exposed; plates removed. Union lower end of graft; upper end free. November 30th, 1920: Graft still exposed, but union firm at both ends. July, 1921: Same as in November.

Case 2.—Pens. P., aged 24. Wounded October 27th, 1918. Non-union of radius. Last operation September 1st, 1919 (Professor Morison): Bone graft to radius fixed with long Lane plate. October 31st, 1919: Lower screw sprung. Discharged with good union of bone and useful hand. Worked regularly till January 24th, 1921, then returned to have plate removed as the lower end was projecting under skin and causing inconvenience. January 28th, 1921: Removal of plate—seventeen months later. First dressing, February 14th, 1921—seventeen days. Healed by first intention.

Case 3.—Pens. P., aged 38. Wounded September 28th, 1918: Fracture of radius. *X* ray showed gap in radius. No union. Operation November 5th, 1920 (Professor Morison): Bone graft—two plates. Dressed December 6th, 1920—thirty-one days. Wound dry; one small granulating area unhealed. Abundant callus and bone appeared firm. In two months the patient started work—working in a shipyard. The new bone was quite strong.

Case 4.—Pens. S., aged 26. Wounded September 21st, 1917. No union of tibia. First operation for bone grafting, October, 1919 (Mr. Cuff), by Albee method, which failed as graft did not unite. Last operation December 10th, 1920 (Professor Morison): Bone graft—three plates. Dressed first time, January 14th, 1921—five weeks. Not quite healed. Leg felt firm. Quite healed March 11th, 1921. Bony union firm with abundant callus. April 28th, 1921: Now strong thick tibia. Plates to be removed. May 3rd, 1921: Plates removed. May 13th, 1921: Dressed. Skin partially sloughed. No bone exposed. June 13th, 1921: Still a little discharge from granulating areas. Union firm—big mass of bone. Patient walking on calliper splint.

Case 5.—Pens. R. P. W., aged 32. Wounded April 13th, 1917. Seven or eight operations before admission. Head of humerus had been removed for ankylosis of humerus to scapula. Last operation January 21st, 1921 (Professor Morison): Bone graft—upper end driven into glenoid; plate at lower end. First dressing March 7th, 1921—six weeks, three days. All healed except two small granulating areas. Large mass of callus. Bones appeared to be united. April 15th, 1921: One small granulating area unhealed. Union at both ends quite firm. Large mass of callus. Good movement of scapula. May 6th, 1921: Operation. Plate removed. June 13th, 1921: Healed, big mass of callus, but union not yet strong. June 17th, 1921: Arm put up on abduction frame with plaster-of-Paris.

Case 6.—Pens. C. A. M., aged 21. Wounded April 28th, 1917: Fracture of humerus. Three previous operations—wiring and step method and bone-grafting of humerus. Last operation January 28th, 1921 (Professor Morison): Bone-graft and plating. Dressed March 11th, 1921—six weeks. All healed except one small granulating area. Union of the graft appeared firm. Second dressing April 22nd, 1921—six weeks. Entirely healed and union firm.

Case 7.—Pens. K., aged 27. Wounded September 16th, 1916: Fracture of left humerus. Five or six previous operations. Attempts to obtain union by step method and wire and plate humerus. Last operation February 4th, 1921 (Professor Morison): Bone graft and plate. Dressed March 18th, 1921—six weeks. One or two small granulating areas in scars. Union of the graft appeared to be quite firm. April 28th, 1921: Humerus thick and firm. An old scar has ulcerated in neighbourhood of plate, which will now be removed. Plate removed July 15th, 1921.

SECTION OF OTO-RHINO-LARYNGOLOGY.

G. WILLIAM HILL, M.D., B.Sc., President.

DISCUSSION ON PROBLEMS IN CONNEXION WITH THE EARLY DIAGNOSIS AND TREATMENT OF MENINGITIS OCCURRING IN AURAL CASES.

OPENING PAPER

BY

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MENINGITIS is the most complex and most dangerous complication of aural disease.

CASE I.

Quite recently I saw a man, aged 40, who for five years had had an intermittent purulent discharge from the left ear. He had been taken ill suddenly with pain in the ear and fever. Three days later the pain was intense and the temperature 104°. The complete mastoid operation was done; in the evening he was somnolent and the next day he died. I saw him in consultation the day after the mastoid operation had been done; he was dying of general meningitis.

This case is an example of malignant meningitis secondary to untreated chronic aural suppuration, and ought not to have ended fatally. The persistence of the disease in the temporal bone is the indication for operation. The indication for operation is not, and ought never to be, the onset of an intracranial complication. We do not await the onset of general peritonitis before removing an inflamed gall bladder, a suppurating Fallopian tube, or a diseased appendix.

CASE II.

A boy, aged 12 years, had a cold on a certain Friday; on Saturday and Sunday he complained of pain in both ears. On Monday evening I saw him; he was drowsy, the temperature was 104° F., there was oedema over the left mastoid and both tympanic membranes were bulging. There was no discharge from either ear. The pulse was 120. The same evening the tympanic membranes were incised and the operation for acute mastoid suppuration was done on the left side. The lateral sinus was exposed for 1 in.; part was pink in colour and inflamed. The next morning he was little, if at all, better, and during the afternoon he was drowsy, complained of headache, was restless and vomited. The temperature was 102°, the pulse had come down to 80, the pupils were somewhat dilated and reacted slowly, tenderness was manifest over the right mastoid, and the optic discs were pinker than normal. The same evening an operation was performed on the right mastoid of an exactly similar character to that which had been carried out on the left side; every cell of the pneumatic mastoid was full of pus, and the dura over the lateral sinus and beyond was red. Lumbar puncture was now done and 2 oz. of clear fluid under pressure withdrawn. The next morning there was no headache, no sickness, no drowsiness, and the pupils reacted well. Convalescence was rapid, and on both sides practically perfect hearing was regained.

This is an illustration of meningitis serosa complicating bilateral acute mastoid disease. The case clearly emphasizes an important fact—namely, that the operation in very acute mastoid inflammation is not complete till lumbar puncture has been done.

Cases are sometimes met with in which meningitis and aural suppuration occur at the same time from the same infection—for example, in general pneumococcus infection, in cerebro-spinal meningitis, and also possibly in influenza; but in most instances meningitis occurring in aural cases is a secondary effect of the ear condition, and if preventive treatment had been carried out would not have occurred. The opportunity for prevention is sometimes not offered, and, alas! is certainly not always taken. In every aural case with acute symptoms, especially when the ear disease is of old standing, it should be carefully considered whether the ear disease alone can account for the symptoms. In most, if not in all such cases, examination of the cerebro-spinal fluid is an essential element in the diagnosis. It is idle to hope that a mastoid operation will cure a case of commencing meningitis maligna.

The symptoms which lead to the suspicion that an aural case is complicated with meningitis are diffuse headache, irritability alternating with somnolence, fever, occasional vomiting, and a pulse more rapid than the temperature would warrant. The patellar reflexes are often suppressed, and Kernig's sign may be present. The cerebro-spinal fluid is under increased pressure. It may be clear or turbid, and in either case may or may not be sterile. According to Barries,[1] constant sterility of the cerebro-spinal fluid obtained by lumbar puncture with severe symptoms indicates the presence of some other suppurative intracranial complication, especially localized pachymeningitis interna suppurativa, or brain abscess, to which, and not to general suppurative meningitis, the symptoms are due.

CASE III.

A man, aged 40 years, came under my observation. I need not detail the history, but attacks of severe headache, drowsiness, dream state, rise of temperature, and nausea were present. More than thirty of these attacks occurred, and were all relieved by lumbar puncture. As time went on the attacks were associated with momentary unconsciousness and were preceded by an aura of a bad taste or a bad smell. The patient kept peppermints in his pocket in case the bad taste came on. The signs induced by the uncinate cortical discharging lesion became the prominent feature of the case. Operation was carried out and an ounce of pus was evacuated from the temporo-sphenoidal lobe. The pus yielded a pure culture of *Staphylococcus aureus*. The lumbar puncture fluid was always milky in appearance and sometimes contained as many as 4,000 polymorphs to the cubic millimetre. It was examined on each occasion for bacteria but without success. The cell proliferation was due to a toxin, not to a micro-organism. The patient recovered.

The varieties of meningitis met with in association with ear disease are (1) meningitis serosa; (2) meningitis suppurativa; (3) meningitis tuberculosa; and (4) the posterior basic meningitis of infants. The first three varieties may be either localized or diffused.

Meningitis Tuberculosa.

This is variously associated with ear disease. Sometimes the meninges become directly infected from a tuberculous temporal bone, and sometimes aural symptoms occur late in tuberculosis. Suppurative tuberculous disease of the temporal bone, by the time it comes under treatment, is always a mixed infection, and thus a meningitis arising therefrom may be either tuberculous or non-tuberculous. An operation on a child with tuberculous temporal bone disease may prove fatal in thirty-six hours, the patient never really recovering from the operation. This fatal event happens occasionally after operation on a tuberculous bone in other parts of the body—for example, the femur—and is explained by the presence of miliary tuberculosis of the meninges which has up to the time of operation produced no symptoms, or none which can be recognized.

I do not propose to discuss the symptoms of meningitis tuberculosa, except to remind you that focal cerebral symptoms may occur which may vary considerably during the course of the illness, and which may lead to brain abscess being suspected. It is well to beware of being led astray in this matter; the rapid pulse and the rise in temperature are generally sufficient to exclude abscess, and, further, the history may disclose the fact that the child was dull and irritable even before illness was suspected.

The more hopeful cases are those with local patches of tuberculous meningitis in continuity with a tuberculous temporal bone. In such circumstances a contralateral hemiparesis or an ipsolateral squint may be observed which in some cases may yield to a complete local operation followed by lumbar puncture.

CASE IV.

A boy, aged 9 years, had a watery discharge from the right ear off and on for three years. For six weeks he had had pain in the head on running. For two weeks there had been violent headaches and severe vomiting. Squint of the right eye due to paralysis of the external rectus had been noticed for one week. Operation forthwith; the mastoid was filled with tuberculous granulation, and the dura was granulating over a considerable area. Lumbar puncture; much fluid removed. The patient made a complete recovery.

CASE V.

Male, aged 12, had right purulent otorrhoea, vomiting, drowsiness, and weakness of left arm. The temperature was 100° and the pulse 110. The temporo-sphenoidal lobe was explored for abscess. The autopsy showed tuberculous meningitis.

CASE VI.

A girl, aged 6, had right ear disease and left hemiplegia. The physician's diagnosis was tuberculous meningitis. No operation. The autopsy showed chronic abscess of the right temporo-sphenoidal lobe.

In meningitis maligna it is not sufficient simply to drain off that quantity of fluid which causes the increased pressure. No one outside a lunatic asylum would dream of treating acute spreading suppuration in the thigh by a trocar and cannula. Why should anyone expect to arrest acute spreading suppuration of the meninges by a cannula? In a spreading suppuration of the soft parts of the thigh, besides the primary incision, counter openings would probably be required in order to obtain free drainage. Secondary incisions of the arachnoid membrane in spreading subarachnoid suppuration cannot be done. All the more, then, should we determine to make the opening into the cisterna as wide as possible.

Posterior Basic Meningitis.

The posterior basic meningitis of infants and young children is a febrile epidemic disease, and is interesting to the aural surgeon in that the tympanum almost always contains pus or muco-pus. The striking sign is the retraction of the head. The drum membranes are often unaffected, appearing quite normal, but on incision pus or muco-pus escapes. This little operation is often followed by a notable remission in symptoms.

I drained the cisterna magna for the first time in 1891, at Great Ormond Street Children's Hospital, by trephining the occipital bone close to the foramen magnum.[2] This is commonly known as the Parkin operation.[3] In cases of posterior basic meningitis the foramen of Magendie may be blocked by the septic exudation, and it is necessary not only to open the cisterna magna but also to break through the pia matral expansion forming the posterior half of the roof of the fourth ventricle.

Meningitis Serosa.

Fluid accumulates more or less rapidly in the subdural, subarachnoid and ventricular spaces. It is well known that an infective focus in the neighbourhood of a serous membrane may so influence it as to lead to a serous effusion into the cavity. For instance, a pleural effusion, which may long remain serous, may be due to suppuration around caries of the rib, or to an abscess deeply placed between the lobes of the lung and quite shut off from the general pleural cavity. In the same way an appendicular abscess or a pyosalpinx may cause serous peritonitis. In like manner extradural suppuration may and often does give rise to meningitis serosa.

The sero-toxic inflammation is ordinarily diffuse, but it may be restricted to the particular part of the cranial cavity nearest to the focus of suppuration. In temporal bone disease the portion of brain liable to infection is the cerebellum or the temporo-sphenoidal lobe. A sero-toxic meningo-encephalitis may occur, the inflammation spreading to the cerebral cortex underlying the affected meninges. Symptoms then may arise indicating disease of some particular portion of the brain. In such cases the diagnosis is made by the cure of the disease by operation. Serous meningitis is most frequent in childhood and early adult life. It is common in acute and fulminating mastoid inflammation, when some portion of the dura exposed at the operation may be found inflamed. In such cases it is far better to expose the dura freely than to leave inflamed bone in contact with this membrane.

The symptoms which may be expected in meningitis serosa are headache, drowsiness, rise of temperature, relatively slow or rapid pulse, restlessness, furred tongue, nausea, aching pain in different parts of the body, absent knee-jerks, and dilated sluggish pupils. Lumbar puncture gives striking relief in most of these cases, and may prevent a serous meningitis from becoming purulent.

The lesson which I have learnt from these cases—and I wish again to lay stress on it—is that in acute mastoid inflammation the operation is incomplete without the performance of lumbar puncture. I also desire to urge that in serious acute mastoid suppuration the wound should be left widely open, and especially is this desirable when the dura is exposed and is known to be inflamed. I am very certain that some cases that I have seen in consultation, and in one or two in which I was myself the operator, the anxious condition of the patients after the operation was the direct result of closure or partial closure of the superficial wound. To close a wound in cases of acute inflammation is contrary to the fundamental principles of our art and science.

Meningitis Suppurativa.

The ordinary and very fatal form of meningitis suppurativa is subarachnoid meningitis, but there are other forms of meningitis suppurativa which are localized or which spread but slowly: (1) a sheet of pus may extend over the arachnoid membrane in the subdural space for some distance, or (2) pus may be limited by the fusing of the membranes together around the area of inflammation. In such cases the signs and symptoms may seem to indicate brain abscess, but a critical study of them ought to negative pus *in* the brain. I have published cases illustrating these various points.

In all cases a blood count should be done and the organism which has caused the infection isolated.

What are the resources of surgery when suppurative meningitis has commenced? It is obvious that the mastoid operation alone will not arrest the disease. Lumbar puncture is a temporary expedient. Incision of the dura will not drain the subarachnoid space.

Otitic meningitis is to some extent comparable with acute peritonitis: both conditions are secondary to an infection without the serous cavity, which must be remedied in order to effect a cure. In peritonitis the causative disease is approached through the serous cavity, and the primary and secondary conditions are dealt with in one comparatively simple operation. In otitic meningitis the operation for the cure of the primary disease does not reveal the condition of the serous cavity (the subdural space), and there is, moreover, a third condition to be remedied—namely, infection of the subarachnoid space, which is the greatest danger, and which opening the subdural cavity does not affect. If confronted with an acute infection of the retroperitoneal tissue in addition to peritonitis we should certainly effect drainage.

In acute purulent lepto-meningitis drainage of the subarachnoid space is the only surgical measure which can succeed. Can we do this efficiently?

The onset of meningitis maligna is sudden and unexpected, like a lightning flash in a clear sky; early diagnosis and prompt and correct action are as urgently required as in laryngeal obstruction or acutely strangulated hernia. I believe that frequent lumbar puncture, puncture of the cisterna magna cerebello-medullaris through the foramen magnum, and even irrigation of the subarachnoid space from a puncture of the ventricles to the lumbar theca are but trifling with a fatal disease. Free drainage is indicated as the only efficient and only hopeful plan of treatment.

Translabyrinthine drainage has one great advantage. It opens the sheath of the arachnoid which lines the internal auditory meatus, and thus forms an ideal but all too narrow a drainage tube for the subarachnoid space. Some cases have been saved from death by this method combined with lumbar puncture, but many more have died. Translabyrinthine drainage certainly should be done when there is pus in the labyrinth. Translabyrinthine drainage may give exit at first to large quantities of infected fluid, but the channel leading from the subarachnoid space tends to become blocked and is thus rendered ineffective for continuous drainage.

CASE VII.

A general was wounded in the head at Gallipoli. Both parietal bones were fractured near the vertex, and haemorrhage occurred from the sagittal sinus. I saw him a week later; he was then unconscious. The wound was very foul, foetid plugs were pulled out from the sinus, and some loose pieces of bone removed, a flap wound of the cortex of the right hemisphere leading into the lateral ventricle was found. Lumbar puncture gave exit to much turbid fluid. The next morning the patient was conscious; irrigation with large quantities of saline solution was carried out from the ventricle to the lumbar theca. The saline solution was coloured with methylene blue, the colour appeared in the escaping lumbar fluid in 25 seconds. This treatment was carried out every day. The patient remained conscious, but died from hypostatic pneumonia at the end of three weeks. The autopsy showed that the meningitis had been cured.

In this case the meningeal spaces and probably also the ventricle were directly infected at the time of the injury. The resulting meningitis was subdued. The large opening

into the ventricle in this case was very favourable to the treatment I adopted. The operation of puncture of the ventricle in cases of meningitis in civil practice in order to carry out irrigation from the ventricle to the lumbar theca has in my hands failed to save life.

When meningitis maligna is recognized at an early stage, the question presses whether the mastoid disease shall be dealt with, or whether efficient drainage of the subarachnoid space alone should be carried out. The first is advisable, but the second is imperative and essential. The point is a difficult one to decide—and each case must be judged separately. The longer an anaesthetic is administered, the less is the chance of recovery. On the whole I should be inclined to recommend that in selected cases free drainage of the subarachnoid space should alone be attempted.

I suggest that the occipital bone should be exposed by the T-shaped Cushing incision, the bone below the inferior curved line, including the posterior boundary of the foramen magnum, removed, and, in some cases, part of the posterior arch of the atlas taken away, the dura widely opened, *the posterior border of the cerebellum raised*, and the arachnoid membrane forming the posterior wall of the cisterna magna incised from side to side. The breadth of the cisterna magna varies from 3 to 7 cm. The depth in the middle line just behind the vermis is 2 cm. The cisterna magna should be drained by placing within it strips of thin rubber tissue or strips of ribbon gauze. It is only because I have not seen one of these cases since the armistice, except in a moribund condition, that I have not attempted this method of treatment.

Dr. Irvine Haynes, in the *Transactions of the American Laryngological, Rhinological, and Otological Society* for 1912, contributes a thoughtful study of the surgical treatment of meningitis. The previous paper in this volume is by Dr. Samuel Kopetzky on the pathology of meningitis. These two papers form an admirable symposium of our knowledge of meningitis. In the following year (1913) the *Transactions* of this society contained a capital paper by Dr. Ewing Day. During the preceding twelve months he had seen twelve cases of suppurating meningitis, nine of which he had drained by Haynes's method. One recovered.

Haynes suggested and practised exposure of the occipital bone below the inion by means of a median incision, the removal of the central portion of the bone, and incision of the dura mater. By this pathway the cisterna magna was exposed and drainage effected.

The median incision does excellently in children, in whom the parts are easily retracted; but in adults the addition of a short transverse incision (as in the crossbow incision of Cushing) greatly facilitates the operation, and is in no way harmful. An inadequate exposure is to be deprecated. I am keen on a very free visual operative field as an aid to the effectual carrying out of free drainage.

When the cerebellum lies low or is forced down through the foramen magnum the division of the arch of the atlas is, I believe, essential to the free visual exposure of the cisterna magna. The surgeon should see what he is doing, and not be content to move a probe about inside the dura mater till a gush of turbid fluid appears. The procedure recommended will not present any difficulties to those surgeons who are familiar with operations in this region.

At an early stage of meningitis maligna the cell elements of the brain are poisoned by the toxins of the disease. It is important to avoid the further poisoning of the cells by the administration of chloroform. When feasible then the anaesthetic chosen should be nitrous oxide and oxygen.

After a craniectomy over the cortex and incision of the dura I have watched the flood of greenish-yellow fluid slowly spreading underneath the arachnoid between the convolutions. What is required is a method of drainage ample enough to reverse the normal current in the cisternae and in the streams and rivulets of cerebro-spinal fluid, and to divert the flow of fluid in them towards the region of drainage. I venture to think that free, unhindered, spontaneous drainage of the cisterna magna will do what no puncture can possibly accomplish. Early diagnosis and prompt operation can alone lead to a successful result.

> "And danger, like an ague, subtly taints
> Even then, when we sit idly in the sun."
> *Troilus and Cressida*, Act III, Sc. 3.

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DISCUSSION.

Sir JAMES DUNDAS GRANT (Consulting Surgeon, Central London Throat and Ear Hospital) congratulated the Section on having the subject placed before it in the light of the principles of general surgery by Sir Charles Ballance. The view that in suppurative meningitis free drainage should be effected before removing the primary focus seemed revolutionary, but was obviously correct in view of the time lost in the carrying out of the radical mastoid operation. The accessibility of the cisterna magna through the occipital bone with the "cross-bow" incision had been demonstrated by Sir Charles Ballance's operations on the posterior fossa, at many of which the speaker had been present. The speaker felt sure that earlier adoption of this method of drainage would give good results. The cases in which the speaker had obtained recoveries were in his opinion of the serous variety, and had yielded to radical mastoid operation and repeated lumbar puncture.

Mr. MUSGRAVE WOODMAN (Surgeon, Ear, Nose and Throat Department, General Hospital, Birmingham) remarked that the operation of suboccipital drainage was difficult, and certainly sanguinary, but relatively safe. He called attention to the bilateral and symmetrical approach to the occipital region, which was necessary, cases of sudden death having been known to occur after a unilateral operation. He asked whether the removal of the posterior wall of the foramen magnum and arch of the atlas was necessary in all cases. He had found it difficult to define the exact position of this operation in dealing with meningitis; he thought it was clearly inapplicable to acute toxic cases, but suggested that it was of considerable value in disease which, although widespread, was not particularly virulent.

Mr. HUNTER TOD, F.R.C.S. (Senior Surgeon, Ear, Nose and Throat Department, London Hospital, etc.), said that apart from the intrinsic value of Sir Charles Ballance's communication, the discussion was of considerable importance in calling attention to the necessity of an early diagnosis in otitic meningitis, for on it successful treatment very greatly depended. He hoped that the report of this discussion would be read by many medical men, especially general practitioners, who, as a rule, first saw the patient. Sir Charles Ballance had compared the pathology of meningitis with that of peritonitis, but it must be remembered that meningitis affected much more vital parts than peritonitis. Peritonitis, formerly so fatal, was now treated with success because it was diagnosed very early; but if a surgeon only saw a case of peritonitis at the stage in which there was already profound toxaemia, could he save the case by an operation?

In meningitis, toxaemia, which might occur with very great rapidity, played a very large part in bringing about a fatal issue in spite of treatment, surgical or medical. For this reason operation could only be advocated in the earliest stage of the disease. Sir Charles Ballance had suggested that the operation for draining the cisterna magna should be undertaken in the first instance, and before performing the mastoid operation, but Mr. Hunter Tod said that he did not understand how this could arrest the infection from the primary focus.

He quoted two cases:

CASE I.

A man, aged 59, on the Thursday of Ascot week had a slight sharp attack of earache in the right ear, which soon passed off. He went to Ascot on the Thursday and Friday. On the Saturday, whilst watching a polo match, he felt severe pains in the head and became rapidly ill. He was taken to London and his doctor called in a nerve specialist, who diagnosed an irritative brain lesion, possibly sunstroke. A lumbar puncture showed increased tension of the fluid, which was opaque. The withdrawal of the cerebro-spinal fluid relieved the symptoms to a certain extent. Next morning, Sunday, he was worse and lumbar puncture was repeated with similar results. I was then called in consultation. On examination of the ears I found that there was a slight redness of Shrapnell's membrane on the right side; beyond this there were no signs of disease of the ears. Owing to the history of earache and the appearance of the tympanic membrane I was convinced that the primary focus causing the meningitis was in the attic region of the right ear, and although I felt the patient might not recover I advised immediate operation as a possibility of saving life.

Operation.—I operated within an hour and a half of seeing the patient. The tip of the mastoid seemed normal, but there

was some red fluid in the cells of the attic region. On puncturing the tympanic membrane no fluid was found in the tympanic cavity. Those present at the operation would not believe that the mastoid was infected. The patient died next day.

Bacteriological Examination.—The cerebro-spinal fluid taken on Saturday showed abundant polynuclear cells, but no micro-organisms. The fluid taken just before the operation contained a few streptococci. A culture taken from a small portion of the mastoid bone grew profuse colonies of streptococci.

In this case it was undoubtedly proved that the apparently slight disease of the attic region was the cause of the meningitis, and suggests that if I had operated on the Saturday night, when perhaps there was only serous meningitis and before profound toxaemia had occurred, the patient's life might have been saved.

CASE II.

A boy was admitted into the London Hospital with all the symptoms of meningitis, although still quite conscious. There was a history of earache on both sides, but more especially on the right. There were no external signs of disease and no pain on pressure over the mastoid processes. There was a history of previous otorrhoea for two or three days on the right side.

Examination showed slight congestion of Shrapnell's membrane on both sides, but more marked on the left side, in which there had been no pain at all. Paracentesis was performed on both sides, nothing but a little blood escaping. Owing to the unreliability of the symptoms, and being unable to tell which was the affected ear, I did nothing further except lumbar puncture; the fluid withdrawn was excessive and opaque.

The boy died the next day. At the autopsy I examined the ears myself. On the right side the mastoid cavity and middle ear seemed normal, except that the mucous membrane was somewhat swollen. On the left side, which had given rise to no symptoms, a small localized extra- and intra-dural abscess, the cause of the meningitis, was found at the tip of the petrous bone corresponding to the roof of the Eustachian tube. The attic region and also the mastoid cells contained pus, but the tympanic cavity was not affected.

Mr. Tod said that such cases showed how difficult it was to determine where the focus of the infection was situated and what surgical measures should be adopted. He therefore advocated that in all cases in which there was a suspicion of meningitis, and in which there had been the slightest symptoms of an inflammatory aural infection, the mastoid should be opened, especially in the attic region and as far forward as possible along the tegmen tympani; and, in addition, that lumbar puncture should be performed, repeatedly if necessary. He believed that if this course were followed without delay successful results would be more often obtained.

Dr. DAN MCKENZIE (Surgeon, Central London Throat and Ear Hospital) said he would like to hear the opinion of the Section upon the question of the danger of septic meningitis following an accidental penetration of the dura mater during operation. He suggested that the danger had been exaggerated. He had himself accidentally wounded the dura on several occasions, but had not so far seen meningitis result therefrom. Simple treatment of such a wound seemed to prevent meningeal infection. This treatment consisted in removing the inner table of the skull around the dural wound and in the deliberate conversion of what was usually a puncture into an incision, between the lips of which some strands of gauze were inserted as a drain. But whether or not that treatment had had anything to do with the subsequent freedom from serious sequelae, the experience of these wounds had led him to the conclusion that, as brain surgery in general plainly showed, there was, if proper precautions were taken, no more risk in opening a healthy dura than in opening the peritoneal cavity. For this reason it might be claimed that even in the milder forms of meningeal infection a relatively free opening of the meningeal spaces might be undertaken without any fear of serious consequences, provided always that the modern aseptic technique was strictly adhered to. At the present stage of knowledge and attainment the two guiding principles in the treatment of septic meningitis were, first, the removal of the primary focus of infection, and, secondly, the drainage of the meningeal spaces. Of these, the first, as all knew, might present insuperable difficulties. It might be easy, it might be difficult, but it was often uncertain. When it could be accomplished there was no doubt, as the older records showed, that septic meningitis might get well without further surgical measures. Nowadays, however, few would contentedly leave such a case to Nature. It should certainly be treated by lumbar puncture and the withdrawal of cerebro-spinal fluid as often as seemed necessary. Some would go further, for, guided by the opinion he had already expressed as to the absence of danger in incising even the healthy meninges, they would open the meninges in the posterior fossa of the cranium if the symptoms were at all pronounced. With regard to the diagnosis of meningitis, he found that as time went on he was inclined, in the more slowly developing cases at all events, to give more regard to the symptoms—irregular pyrexia, headache, vomiting, nystagmus, and rigidity of the spinal muscles of the neck—than to the state of the cerebro-spinal fluid. It had repeatedly been his experience to find the changes of the fluid—cytological, chemical, and bacterial—deferred to a stage in the disease when the patient was beyond help, though this was not invariably the case. Sometimes, on the one hand, the cerebro-spinal fluid had given timely warning of danger, and sometimes also, as the records show, cases might be saved by operation even at a late stage. But in any case in which meningeal symptoms were present it was surely better to intervene early than to temporize until the cerebro-spinal fluid gave undoubted token of the presence of the graver forms of the disease. Having attacked the primary focus of infection, the surgeon had to face the meningeal infection; that might be treated in one of two ways—by repeated or continuous spinal tapping, or by drainage through the posterior fossa. Both might, of course, be used in combination. With regard to the relative advantages of these two routes, it was to be remembered that by opening the meningeal spaces in the posterior fossa the disease was attacked close to the site of origin, and drainage here, if it could be secured, removed what was perhaps the most gravely infected part of the cerebro-spinal system, whereas lumbar tapping must necessarily distribute the infection. Meningeal drainage was often difficult to maintain. Personally, he incised the dura of the posterior fossa close to the labyrinth, and inserted a tube through the opening as far as the cisterna magna. Events being otherwise favourable, success seemed to depend largely upon the freedom with which the cerebro-spinal fluid could be induced to flow.

Mr. J. F. O'MALLEY (Surgeon, Ear, Nose and Throat Department, University College Hospital) said that the suggestion of any new line of treatment in such a serious condition as meningitis, where a certain operative procedure was pursued in one case and the patient recovered, and a similar course was unsuccessful in another case of the same type, was of the utmost importance. The ideal method of surgical treatment of any disease of a septic nature was efficient drainage, and in consequence the condition was attacked by the direct removal of the septic focus. For this reason he was disposed to deal with a case of otitic meningitis by the transmastoid route, accompanied by repeated lumbar punctures. The separation of cases of meningitis into serous and purulent could easily be comprehended, the former being the active response of the serous membrane to the toxic action of a septic focus, and the latter the actual spread of the suppurative lesion. Malignant meningitis was not so easy to understand, from the point of view of its causative agents or the pathological mechanism present. It would be of the first importance if Sir Charles Ballance could give a definite clinical picture of a typical case, as its early recognition would determine the need for the most urgent and vigorous line of treatment. Heretofore the diagnosis had usually been made when a meningitic case terminated fatally at an early stage of the disease. Personally he was inclined to the view that an acute encephalitis was the greatest factor in producing the fatal result and not a pure meningitis, and that this was the reason for the poor response to drainage; in cases where a gross sepsis was found in the mastoid and middle ear, and this was removed, together with the relief of intracranial pressure by lumbar puncture, the result was often gratifying. Where this sepsis was very manifest and the organism causing the suppurative infection of the meninges was not streptococcal, the prognosis was most hopeful.

Mr. W. FRANK WILSON (Assistant Surgeon, Throat and Ear Department, Royal Victoria Infirmary, Newcastle-on-Tyne) gave particulars of a case of chronic middle-ear suppuration with meningitis and lateral sinus infection

(perisinusitis). Three days previous to admission to the Royal Victoria Infirmary, Newcastle-on-Tyne, the patient had severe headache and was dull and stupid, with alternating periods of somnolence and restlessness. There had been rigor on the morning of the day of admission to hospital; there was marked tenderness over the left mastoid and down the same side of the neck, and retraction and rigidity of the head and neck. The patient was very restless and shouting. The temperature was 103° F. Lumbar puncture yielded 30 c.cm. of turbid fluid, and polymorphs and pneumococcal organisms were found in it. Radical mastoidectomy was performed; the antrum was full of foul cholesteatomatous masses; the sinus far forward was covered with foul-smelling greenish pus; the roof of the antrum was absorbed, the dura exposed and covered with pyogenic membranes. The sinus was not thrombosed, but the internal jugular vein was tied in the neck because of the definite history of a rigor and to anticipate general systemic infection. The dura over the antrum and forward to the roof of the tympanum was freely exposed and all infected bone removed. The wound was flushed and left open and drained with bipped ribbon gauzes. The patient, who made an uneventful recovery, was shown among the cases from the Royal Victoria Infirmary at the afternoon demonstrations.

OTITIS MEDIA.

BY

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I SUPPOSE few will question the fact that otitis media, taking all classes of cases from simple earache to chronic suppuration and to chronic mastoiditis, is an exceedingly common disease in this country, and is responsible for an immense total of incapacity of varying degree, and directly or indirectly for not a few deaths.

The Registrar-General's report for 1919 gives 1,015 deaths in England and Wales in that year from "diseases of the ears," and I think it fair to presume that a certain number of the 2,576 deaths registered as "meningitis, other forms," had also their origin in aural disease.

This being so, the general lack of recognition of its seriousness by the public is, in these times of lay interest in matters medical, difficult to understand. Even more incomprehensible is it that there are apparently still some medical men who look upon the disease as one of relatively little importance. In consequence, only in a minority of cases is systematic or skilled treatment undertaken in the acute stage when the prospect of cure is best, and the treatment when adopted is too often not in accord with the acknowledged principles of sound and rational surgery.

The penalties of these errors are: (1) Diminution of hearing power, due to some loss of mobility of the ossicular joints. (2) Acute mastoiditis. (3) Chronic otorrhoea with its risk of chronic mastoiditis and its possible complications and sequelae.

Course and Treatment of Acute Cases.

With the exception of the relatively few cases caused by direct injury, otitis media results from infection arriving by way of the Eustachian tube. The inflammatory process affects the lining membrane of the tympanic cavity, which, like other mucous membranes, responds by turgidity and increased secretion. The latter being either unable to escape owing to swelling of the lining membrane of the Eustachian tube, or being for this reason unable to escape with sufficient rapidity, causes increased pressure within the tympanic cavity. The tympanic membrane can be seen to be first dulled, then usually slightly injected, then fixed and more or less flattened, and finally bulging; these changes sometimes taking place with great rapidity.

It is only in quite the earliest stages that treatment by anodynes, vapours or catheterization is useful. Such a case should be watched carefully and inspected frequently, and as soon as bulging can be certainly seen, though it be only slight, an incision should be made. My opinion has received important support from Sir Charles Ballance's paper this morning.

The external auditory meatus should first be cleansed by filling with hydrogen peroxide, leaving for some minutes, mopping out, filling with pure alcohol, and after a short time mopping out again. Then, preferably under gas or other general anaesthetic, a vertical incision, not a puncture, is made through the membrane behind the handle of the malleus. The escaping fluid varies much both in quantity and quality. I have seen but a drop of it almost water-white; I have seen larger quantities of mucous character; I have seen it intimately mixed with blood so as to seem a large quantity of unusually fluid blood, and once I saw a large quantity of blood-stained pus in a case which was opened only a few hours after the first onset of pain. This last was in an exceedingly acute influenzal-pneumonic infection, but being relieved early, it healed within a fortnight or so with no appreciable loss of hearing and did not go on to mastoiditis. I have mentioned the necessity of cleaning the meatus, and it should not be necessary to insist on the very obvious fact that antiseptic precautions are required throughout.

After evacuating, a very light packing of aseptic strip or ribbon gauze should be put into the meatus. It should not be tight enough to impede in any way the outflow of fluid; but it should absorb what is in the meatus, so that when it is withdrawn little or no further manipulation is needed before redressing. The outer dressing may be aseptic and absorbent (dry), or may be an antiseptic fomentation, as may be considered desirable. Discharge may be profuse for several days, but if the incision has been made early enough healing will take place and good hearing be recovered.

Though it is not denied that cases of such fulminating acuteness do occur that mastoiditis seems to be almost the primary feature, the cases usually seen where incision is done, and a mastoid operation has to follow, are almost without exception those in which the myringotomy is too late. That operation properly done and in due time, and properly guarded from external secondary infection, has no harmful after-effects; on the contrary, the incision heals with great rapidity and hearing is quickly recovered. Even in those "too late" cases of great virulence in which a cortical mastoid follows, the membrane is far more likely to heal where free drainage has thus been established.

The occurrence of discharge is not necessarily a contra-indication to this little operation, as the original perforation may sometimes be found to be wholly inadequate to secure free discharge, and bulging and pain may in such case continue until so relieved.

It is also necessary to insist on careful antiseptic treatment of the ear, whether the discharge be already purulent or not, as my experience on many bacteriological tests has been that the original flora found on incision are either single species or relatively simple combinations, whereas the flora of chronic suppurative cases are very numerous and complicated.

This is strong evidence that in a very large proportion of cases the chief cause of chronicity is secondary infection from without. Other causes of chronicity more generally recognized are (1) the persistence of the original source of infection—for example, the nose, throat or nasopharynx; and (2) the infection of the mastoid antrum and cells which communicate with the tympanic cavity. Such sources of persistent infection when proved present must be dealt with appropriately.

Ionization in Chronic Cases.

For chronic otorrhoea limited to the tympanic cavity or to other cavities accessible therefrom, no method of treatment gives results in any way comparable to those obtainable by zinc ionization. To see the ear of an adult, which has suppurated continuously from childhood in spite of treatment, cease to do so entirely after even one such treatment, is a striking, but as Dr. Friel will corroborate me in saying, not at all an infrequent experience.

The rationale and technique of ionization are sufficiently explained in a paper by Dr. Friel which, with my own comments, was published in the *Transactions of the Royal Society of Medicine* (April, 1921). It will suffice, therefore, to show two appliances for making it more effective. The first is a metal fitting which holds the zinc rod, and is also adapted to carry two wires, one being an insulated one, for the purpose of electrolyzing granulations or the roots of polypi. It is made to attach to the speculum of an old pattern of pneumatic speculum, the whole instrument being used to aspirate out air bubbles and to ensure the

complete filling of the tympanic cavity. The other is Sir Dundas Grant's attic syringe, which can be used to wash out the attic and to fill it with solution. To this I have had added an additional tube, which is straight, to facilitate a complete filling of the tympanic cavity through the perforation when the latter is so small as not readily to admit fluid otherwise. It is by such details of preparation that the scope of benefit in this procedure is likely to be extended.

The question of the cases suitable for treatment by ionization was dealt with in Dr. Friel's paper, and I will only say that I think we shall be able in the near future to bring a greater range of cases within the curative scope of this form of treatment by the preparation for it of cases now considered unsuitable.

The complete cessation of all discharge, the disappearance of granulations which were visible upon the inner tympanic wall, the drying of the interior of the tympanic cavity, and, in cases where the perforation was a small one, sometimes the complete healing and obliteration of the perforation, are observed results.

In cases of otorrhoea treated in other ways it is frequently found that when the ear becomes dry the hearing is much less acute than when it is discharging; when the cessation is due to ionization this diminution of hearing power apparently does not take place, or at all events not nearly to the same extent. On the contrary, in most instances the hearing is improved, and in many cases very markedly. Patients volunteer this statement without being questioned on the subject. Mothers have also remarked that their children have heard and noticed sounds to which they were before indifferent. I have also heard a patient remark the hearing as improved at a stage when the discharge had diminished but not altogether ceased. I can give no physiological explanation of this, but quote it as an observed fact, which was neither sought nor expected. It appears to be the usual if not the universal experience, and is, of course, a point of very high importance. I have not as yet gone into this matter by means of detailed standard tests.

ZINC IONIZATION IN THE TREATMENT OF SUPPURATION IN THE MAXILLARY, FRONTAL, AND SPHENOIDAL SINUSES:

WITH ESPECIAL REFERENCE TO TECHNIQUE.

BY

A. R. FRIEL, M.D., F.R.C.S.I.

THE principles which determine whether zinc ionization is a suitable form of treatment in a case of chronic suppuration in one of the larger air sinuses, and which govern the method of applying it, are the same as in chronic otorrhoea. These were described at a meeting of the Otological Section of the Royal Society of Medicine in February, 1921. The technique, however, is more difficult than in the tympanum. The nasal sinuses are not so accessible, and they communicate with a passage open at both ends, one of which it is desirable to block during the actual treatment. The posterior choana can be closed by means of a small balloon introduced in a collapsed condition into the nasopharynx. It is firmly fixed at the end of a straightened vulcanite Eustachian catheter provided with a short piece of rubber tubing and a stop-cock. When inflated it closes the opening of the nose into the pharynx. As this converts the nose into a well when the patient is lying down, it is easy to keep a sinus full of fluid after it has been filled. It also prevents the patient from swallowing a large quantity of zinc sulphate solution.

To convey the current to the area involved a metal terminal dips into the fluid in the sinus. In the case of the tympanum this was a simple matter. A zinc wire was soldered to the end of a flexible insulated wire attached to the positive terminal of the battery, and was prevented from touching the skin of the meatus by being enclosed in a vulcanite speculum. The current was thus forced to flow to the tissues through the zinc solution in the meatus and tympanum. The same principle is adopted here, but the method is somewhat different. The flexible wire is soldered to a metal catheter which is introduced into the affected sinus. It serves the double purpose of conveying the zinc solution and the electric current. To prevent the latter passing directly to the tissues the outer surface of the catheter is covered by rubber tubing or varnish. The current then flows to the solution from the inside of the catheter and from the solution to the tissues, carrying the zinc ions to them.

Before introducing the zinc solution into a sinus it is necessary to wash away all pus from its interior. Warm normal saline solution is suitable for this purpose. When the sinus is washed clean the saline is washed away by the warm zinc sulphate solution (zinc sulphate 75 gr., glycerin 2 oz., water to 70 oz.).

The position of the patient is important. The sinuses are irregular in shape, and may present diverticula or recesses. As it is essential that all pus and air should be removed from the sinus to allow the zinc solution to come in contact with the whole of the infected area, we endeavour, by remembering the position of the natural openings, to place the head in such a position as facilitates the object we have in view. It has proved convenient to have the patient lying down and to get him to move his head when desirable.

The *maxillary sinus* is washed by first puncturing the wall of the inferior meatus with a Krause's trocar and cannula. Then, when the washing is completed, the cannula is removed and the electrode—the catheter covered with rubber tubing—at once introduced. To fill the sinus, and keep it full, a small reservoir of solution is attached by rubber tubing to the catheter, and a gentle trickle is maintained after the fluid is seen to appear at the anterior nares. If for any reason the flow ceases, air pressure is applied to the surface of the water in the reservoir by putting on a lid in which there is a pipe connected with an air bellows. The barrel of a syringe from which the piston has been removed forms a suitable reservoir. The hole through which the piston passes can be easily closed by a piece of brass tubing connected with an air bellows. The tubing is only inserted when it is necessary to exert pressure on the surface of the fluid in the barrel. A current of 10 to 15 milliampères for a quarter of an hour is ample. When the ionization is finished nothing further is done. If the cavity has been rendered sterile and there are no polypi or granulations to secrete serous fluid liable to decompose, the discharge from the sinus should be entirely absent when the patient is seen the following day, and should not recur.

In the *sphenoidal sinus* the procedure is carried out through the natural opening. This sinus is the one in which, apart from the difficulty in finding the opening, the conditions are simplest.

When the *frontal sinus* is being ionized the patient's head must hang backwards over the end of the table, and in addition the foot of the table should be raised to ensure the sinus being dependent.

Ten milliampères for the frontal sinus and seven for the sphenoidal for ten minutes is an effective dose.

Coexistent ethmoidal disease is a contraindication to ionization of the maxillary or other sinuses, as reinfection would be so likely to occur.

When we realize that zinc ionization is an antiseptic procedure we see at once its sphere of usefulness. In all these cases of chronic sepsis in the ear and nasal sinuses it seems to be the infection of the discharge which occurred during an attack of acute inflammation that is the basic factor in causing chronicity. Other conditions such as polypi or caries may be superadded, and these require treatment of another sort, but in many cases the septic discharge is the sole factor in keeping up the trouble. When the exudation on the surface of the mucous membrane is sterilized, a coagulum is formed by the action of the zinc ions on the albumin present, and this for a short time forms a barrier between the tissues and the exterior. Then the tissues, freed from dealing with the irritation of septic material, rapidly recover their functional and structural integrity.

I would select two cases to illustrate what has been said. A woman had suffered for some weeks from headache and a purulent discharge from the left side of the nose. The maxillary antrum on puncture was found to be full of foetid pus. There were no polypi in the nose, no evidence of ethmoidal disease, and no decayed teeth. After ionization the discharge immediately ceased.

A case of what may be described as pansinusitis was that of a man with septic teeth, empyema of the right and

left maxillary antra, both ethmoids, both frontal sinuses, and one sphenoidal sinus. There was also a discharging opening at the inner angle of the right orbit which communicated with the frontal sinus. The teeth were removed, the antra opened, and the ethmoids curetted. Each frontal sinus was ionized twice, and an autogenous vaccine given. The sphenoidal sinus was ionized and suppuration in it ceased at once. The opening into the orbit closed without any further treatment, and in a short time all discharge from the nose ceased and did not recur.

HARE-LIP AND CLEFT PALATE: A WAR INFLUENCE.

BY

J. L. AYMARD, M.R.C.S., L.R.C.P.,

PORT ELIZABETH.

(*Abridged.*)

I HAVE no intention in this short article of going fully into the question of the treatment of hare-lip. I would, however, remark that war experience impressed upon me the fact that no tissues need be sacrificed. For instance, I find that the mucous border need not always be completely detached, but can almost invariably be incorporated into a useful backing support, helping to give that prominence to the upper lip which is essential to success.

One refinement suggested by extensive work with cartilage relates to the usually lost philtrum in hare-lip. I have been able to restore this prominent feature, with excellent result, by the insertion of small strips of septal cartilage. Together with many other surgeons, I make a practice of closing the hare-lip first, the idea that such practice interferes in any way with the palate operation being quite obsolete.

The worst enemies of the plastic surgeon are sepsis, insufficient blood supply, and tension. All these are constant companions of the cleft palate operation. The wonder is not that cleft palates are so often operative failures but that they ever succeed. Careful examination prior to operation in such cases often reveals not only the presence of adenoid masses but very frequently a condition of rhinitis sicca with accompanying pus.

Let us reflect what happens when we perform the more common Langenbeck operation; let us assume that the parts are healthy though congenitally defective prior to operation, what condition do we immediately create? We raise two flaps off the bone, thereby at once creating four raw surfaces. The nasal surfaces of both the flaps are left bare, as also the bony areas. All these surfaces invite infection, with the result that the wound breaks down. Lane's operation gets over the difficulty by opposing raw surfaces, and for this reason the plastic principles are correct. The measure of success of the palate operation must, however, be judged by its ultimate functional utility, to obtain which the sacrifice and displacement of tissues must be reduced to a minimum. When once surgeons realize that raw surfaces must be reasonably protected, and also recognize the above causes of failure, success will invariably follow.

Early in 1917, at Aldershot, I made several attempts to support tissues with mass paraffin, but failed. Had I skin-grafted the under surface of my flaps these failures would probably have been successes, and much valuable tissue would have been saved.

The grafting of cavities has long been a recognized practice; but it was left to Esser, in 1917, to demonstrate how a cavity could be made and filled with graft-covered dental stent, which was left until the cavity was lined and fit to be opened out to make the extended surface which was the object of the procedure.

My present method of dealing with the cleft palate is based upon Esser's principle. In my first case I worked upon the theory that a graft-covered support of wax secured through the nostrils would not only support the palate but cover the posterior raw surface. I am satisfied that, although I failed to secure the plug in position for more than thirty-six hours, such an operation is feasible and practicable were there no easier method. For three weeks the palate looked perfect, but suddenly broke down. The failure, I think, was due to the inclusion of a portion of the graft in the central incision, producing a weak union. In my second case I worked upon the idea of partially embedding two masses of graft-covered wax in the usual relaxation cuts, and securing them with ligatures. This procedure was a total failure, and the whole broke down at the end of twenty-four hours.

It then occurred to me that Esser's method could be applied, provided a substitute were found for the dental stent. A suitable case presented itself four months ago in a boy of 12 years, with a history of previous operative failure. With the assistance of Drs. Mathew and Gilbert of Port Elizabeth, I performed the operation.

I made small incisions in the usual position internal to the last tooth and carefully freed the hard and soft palate with blunt forceps. I thus formed a pocket on each side, and plugged with gauze. I had previously prepared a wax mass, consisting of paraffin 1 oz., beeswax 2 drachms, iodoform 1 grain, bismuth carbonate 2 grains. I cut two almond-shaped plugs from this mass. I next cut two large Thiersch grafts from the inside of each thigh, approximately 2 in. by 1 in. Each graft was then spread over its wax cone and held in position with medium-sized Kocher forceps. Dr. Gilbert held the edges of the pocket open, and having removed the gauze I dropped the graft-covered wax into the cavity, securing each in turn with one suture. This was the first stage of the operation. The insertion of the wax had practically closed the cleft and made the parts immovable.

The next step as originally intended was to wait ten days, then incise along the cleft border, remove the wax and suture the raw edges. This procedure was adopted upon the fourteenth day. The patient made an uneventful recovery, and the speech was very greatly improved.

The points of interest are many. It occurred to us after reflection that the parts being approximated by the wax, probably a slight incision along the edge and a few sutures would have caused union in the first place. The wax could have been removed later through the original incision. No inconvenience was caused by the mass of paraffin in the pharynx, and the immobility of the palate was marked, and, of course, a most valuable adjunct to success.

Full feeding was permissible from the first, and no attempt was made by Nature to expel the graft-covered foreign body. War experience taught me that a wax body not covered by graft was sooner or later expelled. Here plastic surgeons will appreciate my remarks; does not this open up a whole field of valuable possibilities?

I may not use paraffin plugs in future; I may use plugs of iodoform gauze covered in wax, but the principle of the operation I shall repeat in every other detail upon the first opportunity, with the exception that I shall probably leave the plugs in three weeks instead of ten days.

To sum up: this operation provided protection for all raw surfaces and consequent risk of sepsis, absolute fixation which no other means have so far been found to combat, and the use of free feeding from the first; lastly, the natural position of the tissues is disturbed as little as possible, and the possibility of a useful palate can be hopefully looked forward to.

This operation was performed upon a boy of 12 years, as mentioned above, but I would not hesitate to do the same upon a child of 2 years of age. There appears to be little or nothing to be gained by operating at an earlier age, and much to be lost. A functionating palate, after all, is the only result worth aiming at.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

A CASE OF DELAYED CHLOROFORM POISONING.

AN operation was performed on a patient, a girl aged 13 years, suffering from acute appendicitis of forty-eight hours' duration, and a gangrenous appendix, with about a drachm of foul pus, wrapped round with omentum, was removed *en masse*. Open ether was the anaesthetic administered at first, but as the child appeared very "chesty" chloroform was resorted to later. Very little of the latter anaesthetic was used, and the duration of the operation was just under half an hour.

The patient had completely recovered from the anaesthetic in six hours' time, and she remained comfortable

until early on the Wednesday morning (the operation took place on a Monday) when vomiting recommenced. All day she was very restless, and on Thursday she passed into a stage of active delirium, continually crying out and trying to get out of bed. By Thursday night she became comatose, and finally died at 1.30 on Friday morning.

The urine was examined on the Wednesday and found to contain sugar. Acetone was noticed in the breath on Thursday, but owing to the child being incontinent it was not possible to get a sample of urine to test for its presence.

On *post-mortem* examination the kidney and liver presented marked fatty changes. The following report was received from the Clinical Research Department, St. Bartholomew's Hospital:

Fresh section as well as permanent section of the liver and kidney show widespread fatty degeneration. Especially the distribution of this fatty degeneration in the intermediate zones of the liver lobules is characteristic of late chloroform poisoning.

Royal Salop Infirmary. ALFRED MERRIN, F.R.C.S.I.

NERVE CELL DEGENERATION.

By means of over-staining sections of the central nervous system with aniline blue-black and then partially decolorizing them I have succeeded in demonstrating a series of changes in degenerating nerve cells which differ somewhat from those shown by Nissl's method. In the first place the cell body stains a pale reddish-brown, and the granules appear to be near the surface, are perfectly globular, and are all of the same size. Further, they are much smaller than Nissl's granules and stain a dark brown, showing up very clearly. The nucleus consists of a beaded network or closely packed mass of darker brown granules, rather larger than those of the cell body, and in the midst of them lies a perfectly spherical nucleolus, black in colour and very sharply defined.

The changes in the degenerating cell appear to consist of:

1. Withdrawal of cell granules from the zone of origin of the cell processes, together with the appearance of one or more colourless refractile globules in the nucleolus, which subsequently become extruded.
2. The appearance of extranuclear and extranucleolar globules staining black and the disappearance of granules from the cell body. At this stage the nucleolus may split into two or three smaller globules of equal size.
3. Vacuolation may occur before or after the disappearance of the granules from the cell body, but seems quickly to be followed by disintegration of the nerve cell. By the time that vacuolation has begun the nucleus becomes blurred and its granules are difficult to make out, while the nucleolus remains clearly visible.
4. The nucleolus persists as a sharply defined globule even when there is nothing left of the cell but a granular mass which is very nearly amorphous.

I propose to take an early opportunity of bringing my preparations to the notice of neurologists.

Epsom. H. W. EDDISON.

Reviews.

THE PSYCHOLOGICAL PROBLEMS OF INDUSTRY.

IN the opening chapter of his *Introduction to the Psychological Problems of Industry*[1] Mr. FRANK WATTS suggests that the use of mathematical methods by some psychologists and the distaste of others for public controversy help to account for the light esteem in which, as he thinks, psychologists are held. If psychologists are lightly esteemed—a proposition we should certainly not be prepared to endorse—these can hardly be the explanations. Most men in the street regard pure mathematicians and even philosophers with awe; to eschew the common interests of mankind has even been mistaken sometimes for evidence of mental superiority. A better reason than Mr. Watts gives is that the average English reader likes to know "where to have" his author. He likes a mathematician, let us say, to behave as such. The reader of the late Isaac Todhunter's *Algebra* may not be moved to raptures by the proof of the binomial theorem, he may even think it dull, but he would not have been better pleased had the author attempted to brighten the subject by introducing disquisitions on things in general—say, on the historical importance of the binomial theorem in Western Europe. To apply these considerations to Mr. Watts's own book, we remark that the first one hundred pages are devoted fairly strictly to business; certain experimental methods are described, and the interpretation of the results indicated. In his desire to make things easy Mr. Watts has not perhaps sufficiently emphasized the dangers which await the beginner when he handles statistical methods, but his reader will at least obtain a quite clear idea of the way in which some experimental methods have enriched our knowledge of the human side of industry.

The remainder of the book treats of subjects which the professional psychologist is hardly, if at all, better qualified to treat than any other thoughtful and experienced man. This is not to say that what Mr. Watts has written is uninteresting; it is, on the contrary, a thoughtful study of existing social organization. But the point we wish to make is that "Ideals in Industry," "State Socialism," "Industrial Democracy"—to take a few of Mr. Watts's headings—are too remotely connected with, though, of course, they are not disconnected from, motion study and the measurement of fatigue for it to be advisable to include them in the same volume. Psychology, according to Mr. Watts, is a new science (he presumably means experimental psychology). Being a new science it must not claim a mandate over too extensive territories. This caution is needed because the *average* quality of "new" psychological work is not high. Success needs the coexistence of two faculties, the mental and physical deftness of an experimenter, and that quantitative aptitude which discerns the truth behind and can manipulate massed figures. A cynical professor of philosophy who remarked that students who had not sufficient brains to learn either philosophy or physiology took up experimental psychology was grossly exaggerating, but his sneer had a small basis of truth. Within the purview of medicine, opinions may and do differ as to the ultimate importance of Freud's own work; but there is no doubt at all that a sensible proportion of the growing psycho-analytical "literature" is mere trash. Similarly while the pioneers of "scientific management" and motion study, notably F. B. Gilbreth, were scientific investigators of a high class, some of their self-styled disciples in America are, as Hoxie has pointed out, charlatans.

To Professor Spearman more than to any other psychologist belongs the credit of perceiving that experimental psychology must be thoroughly permeated by the spirit of mathematical reasoning before it can take rank amongst the approved instruments of investigation. We should have welcomed a sketch of the methods of the mathematical psychologists in Mr. Watts's book, even at the cost of making it duller and causing the omission of some agreeable but loose reasoning from analogy.

[1] *An Introduction to the Psychological Problems of Industry.* By F. Watts, M.A. London: G. Allen and Unwin, Limited. 1921. (Demy 8vo, pp. 240. 12s. 6d. net.)

OCULAR PATHOLOGY.

WE extend a very cordial welcome to Professor VICTOR MORAX'S work on ocular pathology,[2] for it is some years since a really good book on this subject was published. The author is well known in this country, and those who were privileged to hear his Bowman Lecture in 1919, and to be present at Oxford this summer, when he opened a discussion on post-operative infection, will not readily forget his masterly addresses: his reputation is world-wide, and justly so. From a man like Morax, who has done so much original work on ocular pathology, we should expect a work which is likely to be a classic, and we may say at once that in the volume before us the author has realized all our hopes.

The subject in its modern sense comprises histology and bacteriology as well as pathology, and the book has been written from this standpoint. It forms the last part of the new edition of the *Manuel d'histologie pathologique* of Cornil and Ranvier, and was to have been published at the end of 1914, but the war delayed its appearance.

Morax handles his subject according to the method of clinical examination in general use—that is, from before backwards, from the lids to the orbit. In each chapter

[2] *Pathologie Oculaire.* By V. Morax. Paris: Librairie Félix Alcan. 1921. (Roy. 8vo, pp. 446; 204 figures, 4 plates. 45 fr. net.)

certain grand divisions are made, such as congenital lesions, traumatisms, infections, atrophies, and new growths. In order to economize space illustrations are made to take the place, as far as possible, of verbal descriptions; in consequence the work is illustrated in a lavish manner with original photographs which have nearly all been derived from the author's clinic in the Lariboisière Hospital. The coloured plates are excellent; three of them are devoted to bacteriology.

Where all is so good it would be invidious to try and express an opinion as to which is the best chapter, but we conclude that the palm will be given by most readers to that on the conjunctiva.

The number of books dealing with this special subject is not large, many of them are out of date and out of print; in our opinion, this book is the best that has appeared since the publication of a similar work by Treacher Collins and Mayou. A copious bibliography and a very full index add materially to the value of the book.

We offer our hearty congratulations to French ophthalmology on the fact that the year 1921 has seen the publication of two such books as Terrien's on the surgery and Morax's on the pathology of the eye.

MEDICAL APHORISMS.

SIR THOMAS HORDER has published, in a handy little volume entitled *Medical Notes*,[3] the *obiter dicta* he has at various times contributed to the *St. Bartholomew's Hospital Journal* and other periodicals. It is now a quarter of a century since he collected in the thirty-second volume of *St. Bartholomew's Hospital Reports* the 258 "clinical aphorisms from Dr. Gee's wards," which were subsequently given to a wider public in a volume that contained also some of the papers of that great bedside teacher.

That Sir Thomas Horder should dedicate these extracts from his own clinical teaching to the memory of his former chief—Samuel Gee—is a gracious if natural act of piety, and it is inevitable that the reader should not only expect but find evidence of this devotion in unconscious or perhaps deliberate imitation. The resemblance, however, is not so much in the matter as in the form and style, in fastidious care in the use of terms and elimination of the superfluous word. In fact, comparison of the two sets of aphorisms suggests that pains have been taken to avoid repetition. The opening remark, "Paraphrasing the well-known description of his art attributed to Demosthenes, it has been said of medicine that the most important thing is diagnosis, the next most important thing is diagnosis, and the third most important thing is diagnosis," might well have been said by Gee, and, as it is put in inverted commas, possibly he was the anonymous speaker. A few of the "notes" are admittedly critical, such as those on some of Sir James Mackenzie's and Sir Thomas Lewis's views on the heart, but as a rule it is his own experience rather than that of others that supplies the text. Successful clinical teaching, such as is embodied in these pages, demands a somewhat dogmatic tone, and as few laws are without their exceptions, it would no doubt be possible to dispute the universal applicability of these well-expressed conclusions. A special charm of some of these *obiter dicta* is a well-balanced antithesis—for example, "Than pleurisy there are probably few diseases more often diagnosed without adequate reasons; there are probably few diseases that exist more often unsuspected"; and again a little further on we read, "Lobar pneumonia not infrequently recrudesces, but rarely relapses; bronchopneumonia often does both." There is, too, a pleasant flavour of mild surprise excited by the warning that "the first thing to say (to oneself) about a systolic bruit heard at the aortic base is that the case is probably not one of aortic stenosis." While the value of instruments of precision is fully realized, the danger that reliance on their use may interfere with the cultivation of clinical observation is indicated in a paragraph ending with the sentence: "the great value of an instrument is to determine the degree of a condition rather than its existence."

From even a superficial study of these two sets of aphorisms, the first of which was edited by the author of the second, the reader cannot but be struck, in spite of the remarkable foresight of Gee, by the changes in the subject matter of medicine that have taken place in the interval, and accordingly he will welcome as well-timed the appearance of Sir Thomas Horder's attractive contribution to our store of medical aphorisms.

[3] *Medical Notes.* By Sir Thomas Horder, M.D., F.R.C.P. London: Henry Frowde, and Hodder and Stoughton. 1921. (Post 8vo, pp. 112. Price 6s. net.)

INDIAN HYGIENE.

THAT *Indian Hygiene and Public Health*,[4] by GHOSH and DAS, has met a want and found an appreciative public, is shown by the fact that four editions have appeared in nine years—1912, 1914, 1917, 1921. While not claiming originality, standard works on hygiene have been consulted and utilized, with special reference to the application to India of the principles inculcated.

Four new chapters appear in the present edition—on animal parasites, especially hookworm, school hygiene, maternity and child welfare, and village sanitation. The advice therein given is good, but in the present state of Indian sanitation is rather a counsel of perfection not likely of attainment in any near future. Cremation is naturally recommended as the best method of disposal of the dead. But to be satisfactory cremation must be complete. Throughout rural India, nine-tenths of the whole country, the bodies of the poor are usually only somewhat charred by burning, and then thrown into a watercourse, swamp, or tank—a very different thing, which indeed can hardly be called cremation.

Under "Plague" the authors state (p. 390) that the first epidemic of this disease recorded in India was in 1612. The Rev. E. Terry, Chaplain to the Embassy under Sir Thomas Roe, sent by James I to the Emperor Jahangir in 1615–19, describes this epidemic in his work *A Voyage to East India*. All the staff of the Embassy, except Roe himself, were attacked; seven died, including the surgeon, whose name has not been preserved. He must have been one of the first British medical officers to serve in India. The symptoms given do not resemble those of modern plague. Jahangir himself, and his third son, afterwards the Emperor Shah Jahan, were attacked but recovered. Jahangir in his memoirs describes the epidemic as widespread but seldom fatal—a marked difference from modern plague epidemics, with their mortality of 80 to 90 per cent.

The authors' style is usually good, especially considering that English is not their native language. The type is clear, and there are not many misprints; several of those noticed are mere transpositions of letters. One specially disfiguring misprint is the use of a small "p" in the Christian name of Sir Pardey Lukis, the late Director-General, in the preface.

[4] *A Treatise on Hygiene and Public Health, with Special Reference to the Tropics.* By Birendra Nath Ghosh, F.R.F.P. and S., and Jahar Lal Das, D.P.H., Calcutta University. Fourth edition. Calcutta: Hilton and Co. London: Simpkin, Marshall, Hamilton, Kent and Co. 1921. (Crown 8vo, pp. 531; 62 figures. 6 rupees, or 9s. 6d. net.)

NOTES ON BOOKS.

THE current number of the *Journal of Anatomy* contains a paper by Professor John S. B. Stopford, of Manchester, on tactile localization; he finds that it is possible to obtain fairly accurate information about the power of localization in the hands and fingers, and to express the result numerically; localization on the wrong segment of a finger may occasionally occur in apparently normal individuals who show no other disturbance of sensation, and he therefore concludes that many of the tests at present in use, which only show gross errors, may lead to mistakes. The same issue contains a paper by Dr. Hillyard Holmes, lecturer in applied anatomy (medical) in the University of Manchester, on the auriculo-ventricular bundle in mammals, and another by Dr. Thurstan Holland on rare ossifications seen during *x*-ray examinations, of which an account was given in the Epitome of August 27th, No. 189.

In a small book, entitled *Sulphur and Sulphur Derivatives*,[5] Dr. HAROLD AUDEN gives a clearly phrased account of some of the more notable sulphur compounds and derivatives, with a view to stimulating popular interest in large-scale chemical manufacture. The volume itself is apparently one of a series of publications dealing on similar lines with forms of industry which, though they result in common every-day commodities, involve the successful application of advancing scientific knowledge.

[5] *Sulphur and Sulphur Derivatives.* By Harold A. Auden, M.Sc., D.Sc., F.C.S. London: Sir Isaac Pitman and Sons. 1921. (Crown 8vo, pp. 101; illustrated. 3s. net.)

THE BRITISH ASSOCIATION.

MEETING IN EDINBURGH.

THE eighty-ninth annual meeting of the British Association opened in Edinburgh on Wednesday, September 7th. The work of the sections, thirteen in number, began on the morning of Thursday, September 8th. The reception, writing and ladies' rooms are at Parliament Hall and Advocates' Library. The inaugural general meeting was held in the Usher Hall, where also the evening discourses and citizens' lectures will be given. The sections meet in the University buildings.

THE PRESIDENT'S ADDRESS.

The president, Sir T. Edward Thorpe, C.B., F.R.S., gave his address on Wednesday evening. He began by recalling that the virtual founder of the Association was Sir David Brewster, that the first meeting was held in York in 1831, and the first meeting in Edinburgh in 1834. At the second meeting in Edinburgh, in 1850, Sir David Brewster presided, and urged the recognition by the State of the importance of scientific research. At the next meeting, in 1871, Lord Kelvin—then Sir William Thomson—in his presidential address maintained the same doctrine, urging that experimental research should be made an object of national concern. These appeals eventually met with response, through the establishment first of the Cavendish laboratory at Cambridge, and afterwards of the National Physical Laboratory, which has accomplished so much both for science and technology. Lord Kelvin in his presidential address urged the Association to undertake the institution of a system for the dissemination of information concerning the results of recent or contemporary investigation. Much, Sir Edward Thorpe said, had been done in this direction, and the need of the day, in view of the increased cost of printing and paper, was co-operation among the various distributing societies. The present high cost of book production, which in the case of specialized books was about three times what it was in 1914, was exercising a most prejudicial effect upon the spread of scientific knowledge. Turning then to the institution of the Department of Scientific and Industrial Research he spoke with enthusiasm of the work that Board had done and was capable of doing; it had fostered research, and had been useful in preventing repetition and overlapping of investigations, and in ensuring that the fullest possible use is made of the results of research. Recently, he said, a departmental committee had been set up to report as to the best method of dealing with inventions made by workers aided or maintained from public funds, so as to give a fair reward to the inventor, to secure the utilization in industry of suitable inventions, and to protect the national interest.

THE MOLECULAR THEORY OF MATTER.

Sir Edward Thorpe then traced the history of the molecular theory of matter—a theory which he said dated back in a crude form to the earliest times, a theory which had never ceased to interest speculative thinkers, and a theory which began to receive full development in the kinetic theory of gases worked out by Joule, Clausius, and Clerk-Maxwell. Since then physicists and chemists had been speculating as to the inner mechanism of the atom; any satisfactory theory must appeal alike to the physicist and the chemist; it must account for the nature of chemical affinity and of valency, and the difference in characteristics of the chemical elements. The investigation of what Lord Kelvin called "the superlatively grand question—the inner mechanism of the atom" has, Sir Edward Thorpe said, profoundly modified the basic conceptions of chemistry. The discovery of the electron, he continued, the production of helium in the radio-active disintegration of atoms, the recognition of the existence of isotopes, the possibility that all elementary atoms are composed either of helium atoms or of atoms of hydrogen and helium, and that these atoms, in their turn, are built up of two constituents, one of which is the electron, a particle of negative electricity whose mass is only 1/1,800 of that of an atom of hydrogen, and the other a particle of positive electricity whose mass is practically identical with that of the same atom—the outcome in short, of the collective work of Soddy, Rutherford, J. J. Thomson, Collie, Moseley and others—are pregnant facts which have completely altered the fundamental aspects of the science. Chemical philosophy has, in fact, now definitely entered on a new phase.

Isotopes.

The theory that all elementary atoms are composed of helium atoms or of helium and hydrogen atoms may be regarded as an extension of Prout's hypothesis—with, however, this important distinction: that whereas Prout's hypothesis was at best a surmise, with little, and that little only weak, experimental evidence to support it, the new theory is directly deduced from well-established facts. The hydrogen isotope H_3, first detected by J. J. Thomson, the existence of which has been confirmed by Aston, would seem to be an integral part of atomic structure. Rutherford, by the disruption of oxygen and nitrogen, has also isolated a substance of mass 3 which enters into the structure of atomic nuclei, but which he regards as an isotope of helium, which itself is built up of four hydrogen nuclei together with two cementing electrons. The atomic nuclei of elements of even atomic number would appear to be composed of helium nuclei only, or of helium nuclei with cementing electrons, whereas those of elements of odd atomic number are made up of helium and hydrogen nuclei together with cementing electrons. In the case of the lighter elements of the latter class the number of hydrogen nuclei associated with the helium nuclei is invariably three, except in that of nitrogen, where it is two. The frequent occurrence of this group of three hydrogen nuclei indicates that it is structurally an isotope of hydrogen with an atomic weight of 3 and a nuclear charge of 1. It is surmised that it is identical with the hypothetical "nebulium" from which our "elements" are held by astro-physicists to be originally produced in the stars through hydrogen and helium.

Sir J. J. Thomson was the first to afford direct evidence that the atoms of an element, if not exactly of the same mass, were at least approximately so, by his method of analysis of positive rays. By an extension of this method Mr. F. W. Aston has succeeded in showing that a number of elements are in reality mixtures of isotopes.

It has been proved, for example, that neon, which has a mean atomic weight of about 20.2, consists of two isotopes having the atomic weights respectively of 20 and 22, mixed in the proportion of 90 per cent. of the former with 10 per cent. of the latter. By fractional diffusion through a porous septum an apparent difference of density of 0.7 per cent. between the lightest and heaviest fractions was obtained.

The atomic weight of the element chlorine has been repeatedly determined, and, for special reasons, with the highest attainable accuracy. On the oxygen standard it is 35.46, and this value is accurate to the second decimal place. All attempts to prove that it is a whole number—35 or 36—have failed. When, however, the gas is analysed by the same method as that used in the case of neon it is found to consist of at least two isotopes of relative mass 35 and 37. There is no evidence whatever of an individual substance having the atomic weight 35.46. Hence chlorine is to be regarded as a complex element consisting of two principal isotopes of atomic weights 35 and 37 present in such proportion as to afford the mean mass 35.46. The atomic weight of chlorine has been so frequently determined by various observers and by various methods with practically identical results that it seems difficult to believe that it consists of isotopes present in definite and invariable proportion.

Argon, which has an atomic weight of 39.88, was found to consist mainly of an isotope having an atomic weight of 40, associated to the extent of about 3 per cent. with an isotope of atomic weight 36. Krypton and xenon are far more complex. The former would appear to consist of six isotopes—78, 80, 82, 83, 84, 86; the latter of five isotopes—129, 131, 132, 134, 136. Fluorine is a simple element of atomic weight 19. Bromine consists of equal quantities of two isotopes—79 and 81. Iodine, on the contrary, would appear to be a simple element of atomic weight 127. Boron and silicon are complex elements, each consisting of two isotopes—10 and 11, and 28 and 29, respectively. Sulphur, phosphorus, and arsenic are apparently simple elements. Their accepted atomic weights are practically integers.

All this work is so recent that there has been little opportunity, as yet, of extending it to any considerable number of the metallic elements. These, as will be obvious from the nature of the methods employed, present special difficulties. It is, however, highly probable that mercury is a mixed element consisting of many isotopes. Lithium is found to consist of two isotopes, 6 and 7. Sodium is simple, potassium and rubidium are complex, each of the two latter elements consisting, apparently, of two isotopes.

The accepted atomic weight of caesium, 132.81, would indicate complexity, but the mass spectrum shows only one line at 133. Should this be confirmed caesium would afford an excellent test case. The accepted value for the atomic weight is sufficiently far removed from a whole number to render further investigation desirable.

The Structure of the Atom.

While these new facts do not invalidate or even weaken periodic law they confirm the opinion that the expression as Mendeléeff left it is imperfect. Moseley showed that the real sequence was the atomic number, not the atomic weight. All these new observations illustrate the fact that science advances by additions to its beliefs rather than fundamental or revolutionary changes in them.

The nature and quantity of the materials of which atoms are made up being known, it is seen that the properties of the atom will in part depend upon the way in which the electrons are arranged in the atom. The arrangement will depend partly on the forces between the electrons and partly on those between the electrons and the positive charges (protons). Mathematical investigation showed that it was possible that the positive charge should be at the centre with the negative electrons around it on the surface of a sphere, providing that the electrons were not too numerous. The mutual repulsion of the electrons resented overcrowding, and Sir J. J. Thomson had shown that when there are more than a certain number the attraction of a positive charge is not able to keep the electrons in stable equilibrium. The number of electrons which can be accommodated on the outer layer will depend upon the law of force between the positive charge and the electrons, and Sir J. J. Thomson has shown that with a law of force of a simple type this number will be eight.

The Periodic Law.

To show the bearing of this result as affording an explanation of the Periodic Law, let us, to begin with, take the case of the atom of lithium, which is supposed to have one electron in the outer layer. As each element has one more free electron in its atom than its predecessor, glucinum, the element next in succession to lithium, will have two electrons in the outer layer of its atom, boron will have three, carbon four, nitrogen five, oxygen six, fluorine seven, and neon eight. As there cannot be more than eight electrons in the outer layer, the additional electron in the atom of the next element, sodium, cannot find room in the same layer as the other electrons, but will go outside, and thus the atom of sodium, like that of lithium, will have one electron in its outer layer. The additional electron, in the atom of the next element, magnesium, will join this, and the atom of magnesium, like that of glucinum, will have two electrons in the outer layer. Again, aluminium, like boron, will have three; silicon, like carbon, four; phosphorus, like nitrogen, five; sulphur, like oxygen, six; chlorine, like fluorine, seven; and argon, like neon, eight. The sequence will then begin again. Thus the number of electrons, one, two, three, up to eight, in the outer layer of the atom, will recur periodically as we proceed from one element to another in the order of their atomic weights, so that any property of an element which depends on the number of electrons in the outer layer of its atom will also recur periodically, which is precisely that remarkable property of the elements which is expressed by the Periodic Law of Mendeléeff, or the Law of Octaves of Newlands.

Valency.

The valency of the elements, like their periodicity, is a consequence of the principle that equilibrium becomes unstable when there are more than eight electrons in the outer layer of the atom. For on this view the chemical combination between two atoms, A and B, consists in the electrons of A getting linked up with those of B. Consider an atom like that of neon, which has already eight electrons in its outer layer; it cannot find room for any more, so that no atoms can be linked to it, and thus it cannot form any compounds. Now take an atom of fluorine, which has seven electrons in its outer layer; it can find room for one, but only one, electron, so that it can unite with one, but not with more than one, atom of an element like hydrogen, which has one electron in the outer layer. Fluorine accordingly is monovalent. The oxygen atom has six electrons; it has, therefore, room for two more, and so can link up with two atoms of hydrogen: hence oxygen is divalent. Similarly nitrogen, which has five electrons and three vacant places, will be trivalent, and so on. On this view an element should have two valencies, the sum of the two being equal to eight. Thus to take oxygen as an example, it has only two vacant places, and so can only find room for the electrons of two atoms; it has, however, six electrons available for filling up the vacant places in other atoms, and as there is only one vacancy to be filled in a fluorine atom the electrons in an oxygen atom could fill up the vacancies in six fluorine atoms, and thereby attach these atoms to it. A fluoride of oxygen of this composition remains to be discovered, but its analogue, SF_6, first made known by Moissan, is a compound of this type.

The term "atomic weight" has thus acquired for the chemist an altogether new and much wider significance. It has long been recognized that it has a far deeper import than as a constant useful in chemical arithmetic. For the ordinary purposes of quantitative analysis, of technology, and of trade, these constants may be said to be now known with sufficient accuracy. But in view of their bearing on the great problem of the essential nature of matter and on the "superlatively grand question, What is the inner mechanism of the atom?" they become of supreme importance. Their determination and study must now be approached from entirely new standpoints and by the conjoint action of chemists and physicists. The existence of isotopes has enormously widened the horizon.

POISON GAS.

The crisis through which we have recently passed has had a profound effect upon the world. The spectacle of the most cultured and most highly developed peoples on this earth, armed with every offensive appliance which science and the inventive skill and ingenuity of men could suggest, in the throes of a death struggle must have made the angels weep. That dreadful harvest of death is past, but the aftermath remains. Some of it is evil, and the evil will persist for, it may be, generations. There is, however, an element of good in it, and the good, we trust, will develop and increase with increase of years. The whole complexion of the world—material, social, economic, political, moral, spiritual—has been changed, in certain aspects immediately for the worse, in others prospectively for the better. It behoves us, then, as a nation to pay heed to the lessons of the war.

The great war differed from all previous internecine struggles in the extent to which organized science was invoked and systematically applied in its prosecution. In its later phases, indeed, success became largely a question as to which of the great contending parties could most rapidly and most effectively bring its resources to their aid. The chief protagonists had been in the forefront of scientific progress for centuries, and had an accumulated experience of the manifold applications of science in practically every department of human activity that could have any possible relation to the conduct of war. The military class in every country is probably the most conservative of all professions and the slowest to depart from tradition. But when nations are at grips, and they realize that their very existence is threatened, every agency that may tend to cripple the adversary is apt to be resorted to—no matter how far it departs from the customs and conventions of war. This is more certain to be the case if the struggle is protracted. We have witnessed this fact in the course of the late war. Those who, realizing that in the present imperfect stage of civilization wars are inevitable, and yet strove to minimize their horrors, and who formulated the Hague Convention of 1899, were well aware how these horrors might be enormously intensified by the applications of scientific knowledge, and especially of chemistry. Nothing shocked the conscience of the civilized world more than Germany's cynical disregard of the undertaking into which she had entered with other nations in regard, for instance, to the use of lethal gas in warfare. The nation that treacherously violated the Treaty of Belgium, and even applauded the action, might be expected to have no scruples in repudiating her obligations under the Hague Convention. April 25th, 1915, which saw the clouds of the asphyxiating chlorine slowly wafted from

the German trenches towards the lines of the Allies, witnessed one of the most bestial episodes in the history of the great war. The world stood aghast at such a spectacle of barbarism. German *kultur* apparently had absolutely no ethical value. Poisoned weapons are employed by savages, and noxious gas had been used in Eastern warfare in early times, but its use was hitherto unknown among European nations. How it originated among the Germans—whether by the direct unprompted action of the higher command or, as is more probable, at the instance of persons connected with the great manufacturing concerns in Rhineland—has, so far as I know, not transpired. It was not so used in the earlier stages of the war, even when it had become a war of position. It is notorious that the great chemical manufacturing establishments of Germany had been for years previously sedulously linked up in the service of the war which Germany was deliberately planning—probably, in the first instance, mainly for the supply of munitions and medicaments. We may suppose that it was the tenacity of our troops and the failure of repeated attempts to dislodge them by direct attack that led to the employment of such foul methods. Be this as it may, these methods became part of the settled practice of our enemies, and during the three succeeding years—that is, from April, 1915, to September, 1918—no fewer than eighteen different forms of poison—gases, liquids, and solids—were employed by the Germans. On the principle of Vespasian's law, reprisals became inevitable, and for the greater part of three years we had the sorry spectacle of the leading nations of the world flinging the most deadly products at one another that chemical knowledge could suggest and technical skill contrive. Warfare, it would seem, has now definitely entered upon a new phase. The horrors which the Hague Convention saw were imminent, and from which they strove to protect humanity, are now, apparently, by the example and initiative of Germany, to become part of the established procedure of war. Civilization protests against a step so retrograde. Surely comity among nations should be adequate to arrest it. If the League of Nations is vested with any real power, it should be possible for it to devise the means, and to ensure their successful application. The failure of the Hague Convention is no sufficient reason for despair. The moral sense of the civilized world is not so dulled but that, if roused, it can make its influence prevail. And steps should be taken without delay to make that influence supreme, and all the more so that there are agencies at work which would seek to perpetuate such methods as a recognized procedure of war. The case for what is called chemical warfare has not wanted for advocates. It is argued that poison gas is far less fatal and far less cruel than any other instrument of war. It has been stated that "amongst the 'mustard gas' casualties the deaths were less than 2 per cent., and when death did not ensue complete recovery generally ultimately resulted. . . . Other materials of chemical warfare in use at the Armistice do not kill at all; they produce casualties which, after six weeks in hospital, are discharged practically without permanent hurt." It has been argued that, as a method of conducting war poison gas is more humane than preventive medicine. Preventive medicine has increased the unit dimension of an army, free from epidemic and communicable disease, from 100,000 men to a million. "Preventive medicine has made it possible to maintain 20,000,000 men under arms and abnormally free from disease, and so provided greater scope for the killing activities of the other military weapons. . . . Whilst the surprise effects of chemical warfare aroused anger as being contrary to military tradition, they were minute compared with those of preventive medicine. The former slew its thousands, whilst the latter slew its millions and is still reaping the harvest." This argument carries no conviction. Poison gas is not merely contrary to European military tradition; it is repugnant to the right feeling of civilized humanity. It in no wise displaces or supplants existing instruments of war, but creates a new kind of weapon, of limitless power and deadliness. "Mustard gas" may be a comparatively innocuous product as lethal substances go. It certainly was not intended to be such by our enemies. Nor presumably were the Allies any more considerate when they retaliated with it. Its effects, indeed, were sufficiently terrible to destroy the German *moral*. The knowledge that the Allies were preparing to employ it to an almost boundless extent was one of the factors that determined our enemies to sue for the Armistice. But if poisonous chemicals are henceforth to be regarded as a regular means of offence in warfare, is it at all likely that their use will be confined to "mustard gas," or, indeed, to any other of the various substances which were employed up to the date of the Armistice? To one who, after the peace, inquired in Germany concerning the German methods of making "mustard gas," the reply was: "Why are you worrying about this when you know perfectly well that this is not the gas we shall use in the next war?"

I hold no brief for preventive medicine, which is well able to fight its own case. I would only say that it is the legitimate business of preventive medicine to preserve by all known means the health of any body of men, however large or small, committed to its care. It is not to its discredit if, by knowledge and skill, the numbers so maintained run into millions instead of being limited to thousands. On the other hand, "an educated public opinion" will refuse to give credit to any body of scientific men who employ their talents in devising means to develop and perpetuate a mode of warfare which is abhorrent to the higher instincts of humanity.

This Association, I trust, will set its face against the continued degradation of science in thus augmenting the horrors of war. It could have no loftier task than to use its great influence in arresting a course which is the very negation of civilization.

MEMORIAL TO SIR VICTOR HORSLEY.

THE following further subscriptions have been promised or received on behalf of the memorial to the late Sir Victor Horsley, C.B., F.R.S., particulars of which were published in our issue of January 1st, p. 19, February 19th, p. 281, and May 7th, 1921, p. 683:

FOURTH LIST OF SUBSCRIPTIONS.

£5 5s.—Donald Armour, C.M.G., Ernest Clarke, Colonel Littlewood, C.M.G., W. Rushton Parker, Dr. C. E. Reynolds (Los Angeles), G. E. Twynam.

£3 3s.—Sir N. M. A. Abbot-Anderson, M.V.O., C. S. Handley.

£2 2s.—Dr. C. Bolton, Herbert H. Brown, Captain L. F. Hine, Dr. A. Jones, Edward F. Maynard, Dr. A. McCormick (Sydney), Dr. J. J. A. Neil.

£1 1s.—Dr. J. Blamey, Dr. C. E. Evans, Dr. J. Lockhart Gibson (Brisbane), Dr. E. G. L. Goffe, F. P. Mackey, Dr. Nabarro, Professor J. T. Wilson.

£1.—Dr. L. de Zilwa (Ceylon).

7s.—J. W. Papillon.

£2 6s. 5d.—National Hospital (Queen Square).

The amount acknowledged in previous lists is £818. A meeting of the Executive Committee will be held at the end of October to decide as to the disposition of the fund. Subscriptions should be sent to Mr. Edward J. Domville, O.B.E., Symondsbury, Bridport, one of the honorary secretaries; the other honorary secretary is Sir William Arbuthnot Lane, Bt., 21, Cavendish Square. The honorary treasurers are Sir Frederick Mott, K.B.E., Maudsley Hospital, Denmark Hill, S.E., and Dr. H. H. Tooth, C.B., C.M.G., 34, Harley Street, W.

The first number, dated July, 1921, has appeared of the *Burmah Medical Times*, a small monthly periodical published in Rangoon.

MR. E. G. FENTON, F.R.C.S.I., has recently communicated to the Royal Dublin Society a paper on the physiography and glacial geology of Southern Patagonia, in which dreary land he spent seven and a half years. It is very flat, with a slight incline towards the Atlantic. The surface is a thick layer of coarse shingle, which lies on well stratified middle tertiary rock. There are a few river valleys and a number of undrained hollows. In places the surface is partly covered by late lava. The puzzle is to account for the shingle, which not only covers the whole of the land surface at all elevations, but extends, as Darwin found during his voyage in the *Beagle*, for hundreds of miles into the Atlantic. Dr. Fenton's suggestion in outline is that the shingle was deposited by ice, and that the ice advanced and receded more than once. His paper was communicated to the society by Professor Cole, F.R.S., and his suggestions will no doubt have the careful consideration of geologists.

British Medical Journal.

SATURDAY, SEPTEMBER 10TH, 1921.

THE DANGERS OF CARBON MONOXIDE IN LIGHTING GAS.

THE report has been published of a Departmental Committee appointed, under the chairmanship of Sir William Pearce, M.P., by the Board of Trade, to inquire as to the desirability of prescribing any limitation in the proportion of carbon monoxide used in ordinary lighting gas. At present there is no legal limitation; but since the report of a previous committee, appointed by the Home Office in 1898, gas containing a very high percentage has not been distributed in this country.

The present committee reports "that it is not necessary or desirable to prescribe any limitations of the proportion of carbon monoxide which may be supplied in gas used for domestic purposes." If there were reason to believe that gas undertakings will continue to follow the present practice in this country of keeping the percentage of carbon monoxide within moderate bounds we should hesitate to criticize the present report. The country is certainly sick of official restrictions on industry. The committee's report, however, is extremely likely to induce the directors of gas undertakings to make a series of dangerous experiments on the public; and we consider it our duty to point out the dangers quite clearly, as the committee has evidently failed to realize them.

The former committee made a very thorough experimental inquiry into the dangers of poisoning by lighting gas in dwellings. This inquiry showed (1) that the danger of poisoning is entirely due to the carbon monoxide in the gas; (2) that where ordinary coal gas is distributed poisoning by gas in houses is extremely rare; whereas in American towns, where carburetted water gas (containing about 28 per cent. of carbon monoxide, as compared with 7 per cent. in coal gas) is distributed in place of ordinary coal gas, cases of poisoning are very frequent, a large proportion of these cases being suicidal and a certain proportion homicidal; (3) that nearly all the cases are due to unlit gas being left turned on at night in bedrooms.

The experiments showed quite clearly why an increase in the proportion of carbon monoxide causes such a totally disproportionate increase in the risk of poisoning. It was found that when ordinary coal gas was allowed to escape in a room, even with a burner removed, it was almost impossible to produce a poisonous atmosphere at the sleeping level, however long the escape lasted. The gas always passed out through the walls, roof, etc., at a sufficient rate to prevent the percentage of carbon monoxide in the air from rising to the danger level. This was so in even comparatively small rooms. When, however, the percentage of carbon monoxide in the gas is considerably increased, a poisonous percentage at the sleeping level is easily produced. The American records show that, with carburetted water gas, poisoning may even occur although a window is left open.

It might be expected that because the risk of poisoning by ordinary coal gas is so very trifling, the additional risk due to a considerably higher percentage of carbon monoxide in lighting gas would still be quite small. Neither actual statistics nor the results of experiments justify this expectation. From the figures quoted by the present committee, as compared with those of the former committee, it seems clear that there has been during the last few years in this country a great increase in the number of cases of poisoning by lighting gas, though the number is still small in comparison with the number in the United States. The increase in this country has been coincident with increase in the partial admixture of water gas with coal gas. The water gas may either be made in a separate plant, or by the addition of steam to ordinary coal gas retorts, though of this latter addition the report, quite unjustifiably, takes no account.

No analyses or experimental investigations of any kind seem to have been made by, or for, the committee. Nor does it publish any summary of the evidence submitted to it. Its references to the statistics of poisoning by lighting gas are very meagre and unsatisfactory, and no mention is made of the large number of cases of suicide by lighting gas in the United States and the increasing number in this country. Nevertheless it publishes in full an extraordinary memorandum from an unnamed official of the United States Public Health Service. It appears that this official thinks that an increase in the percentage of carbon monoxide in lighting gas is of no practical importance. He also imagines that the toxic action of carburetted water gas is largely due to the illuminant constituents, as "these are soluble in lipoidal tissue, and hence will be retained to a certain extent in the nerve cells."

There are often distinct economic advantages to be gained by supplementing by means of water gas the manufacture of coal gas; but it is very improbable that public opinion in this country will tolerate the risks which to all appearance will be run if the gas distributed contains as high a percentage of carbon monoxide as in towns in the United States. We do not favour putting legal restrictions on any industry unless a clear case has been made out for their necessity. We hope the necessity will not arise in this instance; but we also fear that gas engineers may be misled to such an extent by the present report that restrictive legislation may very soon become imperative.

It is always a difficult matter to balance risk to life against economic advantages; but so far as we can judge, the present committee has both exaggerated the economic advantages of a very high percentage of carbon monoxide in lighting gas and greatly underestimated the risk to life. It is at least evident that the report is quite unconvincing, and that the dangers due to increasing percentages of carbon monoxide in lighting gas will require to be watched with great care by members of the medical profession, and particularly by medical officers of health.

TREATMENT OF CANCER OF THE BREAST.

THE August part of *Medical Science* contains an article by W. G. S. and C. L. entitled "Statistics relating to the treatment of cancer of the breast by excision, supplemented by radiation," which well illustrates the difficulties to be encountered in the statistical analysis of clinical data, difficulties which von Kries regarded as insuperable,[1] and which are indeed very formidable.

Prima facie, the problem is not complex. Is the

[1] *Die Principien der Wahrscheinlichkeitsrechnung*, Freiburg, 1886, p. 244 et seq.

expectation of cure greater when treatment by radiation supplements excision? The technique of excision reached a high level many years ago; carefully compiled series of statistics exist, and it is reasonable to suppose that, given absolutely long series of cases, the proportion of advanced cases will not be correlated with the method of treatment.

But, so soon as one examines the data, difficulties arise. In the first place, many published series have to be discarded because the proportion of cases lost sight of is large or there is reason to suspect a special selection of data. Having winnowed the data in this way, we have to decide upon the method of comparison, the statistical criteria to be adopted. If, for instance, one method yields a larger proportion of early recurrences and also a larger proportion of survivals after, say, five years, are we to regard that as the preferable method? When we reach this stage we find that the data are absolutely insufficient in number to permit of useful sub-tabulation. Thus Tichy of Marburg reports upon 62 cases not *x*-rayed after operation and 61 in which the scar was *x*-rayed at least once or the scar and also the axillary and supraclavicular region were *x*-rayed several times. Of the former series, 7 gave recurrence within a year, 20 within three years, and 13 remained free from recurrence after five years. Of the latter series 23 had recurrence within a year, 37 within three years, and 19 remained free from recurrence after five years. Hence, according to the face value of these figures, the combined treatment saves more lives ultimately but shortens the average period of freedom of those who are destined to suffer a recurrence. It is of course a fairly simple statistical operation to determine whether these two series might be expected to have arisen by mere random sampling of a "universe" in which the probabilities of recurrence and of ultimate survival are constant—that is, to decide whether the large differences in the percentages are "significant." But, assuming such a calculation to have been made and to have yielded large odds against such divergencies, no cautious statistician would draw any important inferences therefrom. He would need data permitting him to assess the influence, if any, of age upon the expectation; he could not safely postulate an equal distribution of age in such small samples, and many other disturbing factors, all of which must be evaluated numerically, suggest themselves. It will be seen, then, that the numerical solution of the problem is not a simple matter of contrasting percentages even when the probable errors of "simple random sampling" can be computed.

If, however, we waive these difficulties and confine ourselves merely to the one question of survival after five years, then there seems no important difference between the various series and methods. Halsted for 204 operations before supplementary use of radiation reports 20 per cent. alive and well after five years; the Marburg series, as we have seen, gives 21.0 per cent. without and 31.1 per cent. with radiation; a Tübingen series (130 not *x*-rayed, 144 lightly *x*-rayed) gives 27.7 per cent. and 20.3 per cent. (we quote the percentage; there is some error in the actual number, which is printed as 5—that is, 3.5 per cent.). Lehmann and Scheven report 27.7 per cent. (total number not given) free from recurrence in five years without radiation. Brattström's series, 296 cases not apparently treated by radiation, gave 23 per cent. free from recurrence after five years. We cannot extract comparable percentages from Hoffmann's series.

A general review, therefore, suggests that a verdict of not proven must be given, or rather that the hearing must be adjourned until further evidence is available. It is, we think, quite certain that no useful results can be derived from the publication of short series of cases without full details, making it possible to combine individual experiences, or—which is equally important—to show why they cannot be pooled. It is not, as some have urged, an inherent defect of the statistical method, but the faulty presentation of data, which leaves problems such as these unsolved.

We believe that instruction not so much in statistical analysis as in the compilation and recording of data ought to be an important if humble part of the training given in the newly established teaching units of the great medical schools. Far too little use has been made of numerical data, partly because the method of recording has been unsatisfactory, partly because medical students (and their teachers) have not even an elementary knowledge of statistical principles. Such a problem as the one here discussed cannot, of course, be solved solely by analysis of hospital records, but those records would furnish an important element to the solution, and the students trained on sound lines would be able in after-life to assemble further data, which only general practitioners of medicine can collect.

THE TERMINATION OF THE WAR.

AN Order in Council has declared that the thirty-first day of August, 1921, shall be treated as the date of the termination of the war. Consequent upon this the Local Government (Emergency Provisions) Acts of 1916 automatically ceased to be operative on September 1st. The last section of the earlier of these Acts, however, enabled the Local Government Board to continue any portion of the Acts for a period not exceeding one year. The Ministry of Health, having taken over the powers of the Board, has made an Order continuing the whole of the later Act and certain portions of the earlier. This action of the Ministry restores the old scale of fees paid to a medical practitioner for notifying to a medical officer of health cases of infectious disease. All such certificates dated on and after September 1st will be paid for at the rate of two shillings and sixpence if the case occurs in his private practice and of one shilling if in his practice as medical officer of any public body or institution. It is of importance to note that it is still necessary for the medical attendant to notify the medical officer of health of a case of infectious disease occurring in a building in the occupation of His Majesty's forces, or where the patient is employed by the Admiralty, or the Army Council. The fee for this service is one shilling, except in the case of a medical officer who holds a commission in any of his Majesty's forces, in which case no fee is payable. Another result of the official termination of the war is dealt with in a circular issued to local authorities by the Ministry of Health on August 30th. It appears that during the war certain appointments of medical officers of health and inspectors of nuisances received the sanction of the Minister only for the duration of the war. This sanction is extended to March 31st next, the day before there comes into force the Public Health (Officers) Act, 1921, which gives security of tenure to these officers. In the case of these war-time appointments the approval of the Minister to their continuance must be obtained at the latest by April 1st, 1922. Local authorities are also reminded that a new scale of temporary increases of remuneration for civil servants came into force on September 1st, and that although it is for the authorities to decide what amount of increase shall be made to its own officials, the new scale must not be exceeded.

THE BRITISH ASSOCIATION.

THE President, in opening the meeting of the British Association in Edinburgh on Wednesday, did not let off any intellectual fireworks. His address was sober and informing; it did not seek to tickle the credulity or excite the fears of the people, but in its concluding passages Sir Edward Thorpe gave expression to the detestation aroused in the minds of most British men of science—of chemists, perhaps, in particular—by the German use, in April, 1915, after long preparation during peace, of poison gases as a method of warfare. The method has found defenders even here; it is possible to understand the argument that the gases used killed few, though they incapacitated many for a time, without thereby being brought to agree that poison gas is a legitimate means of civilized warfare. Apart from the fact that damage is often more permanent than the apologists seem to suppose, there must surely be a warp in the mind which makes it a reproach to preventive medicine that in this last war it preserved the lives of combatants who in earlier times would have been killed by disease. The greater part of Sir Edward Thorpe's address was devoted to an explanation of the molecular theory of matter. There has been much discussion on the subject among physicists and chemists during the last ten or twelve years, although the fundamental conceptions which are now being worked out took origin at a much earlier date. The present advanced position of the subject is in large measure due to the experimental and theoretical work of Sir J. J. Thomson, of Sir Ernest Rutherford, of Professor Soddy, and of Sir W. H. Bragg and his son, Professor W. J. Bragg. The progress made has been noticed from time to time in our columns, and it is highly interesting and instructive to have Sir Edward Thorpe's consecutive account, which is extraordinarily clear and graphic, and moreover free from mathematical complication.

LEONARDO DA VINCI.

IMMORTAL for his "Mona Lisa" and "The Lord's Supper," and famous for his powerful influence on young Raphael and his controversy with Michael Angelo, Leonardo da Vinci (1452–1519) has a special interest for the medical profession on account of the scientific activity of his versatile mind, which did much for anatomy and physiology. The publication of the Anatomical Contributions of Leonardo da Vinci by Jacob Dybwad of Christiania was begun in 1916 and completed in 1919, about 425 years after these famous studies were made. It is appropriate therefore that Dr. John C. Hemmeter[1] of Baltimore should have taken this opportunity of publishing a tastefully illustrated essay on "Leonardo da Vinci as a Scientist." His genius was most comprehensive; he was one of the first in the age of the Renaissance to undertake a philosophic organization of the empirical knowledge of Nature, and, long before Bacon, usually regarded as the father of natural science, he experimented and took as his motto: "Experiment never deceives, it is only our judgement that goes astray when we make deductions not inherent in the former." He was a great physicist. His *Codex Atlanticus* laid the foundation of measuring distances at sea, and in his treatise on hydraulics he discussed the equilibrium of liquids and recognized the nature of wave motion long before Newton's time. As a military engineer he had many ideas; he invented the "architonitrus," a copper contrivance that ejected projectiles by means of steam—a sort of steam cannon; he built revolving mitrailleuses (machine guns), and designed a swimming belt, a diving apparatus, various flying machines, and three hundred years before Lenormond (1787) had drawn a parachute with adequate dimensions for safety. By discovering the laws of inertia and motion he prepared the way for Galileo's and Newton's investigations into the movements of the heavenly bodies. His invention of the camera obscura led him to utilize it in explaining the functions of the eye, and thus entitles him to a division of the honours for the founding of physiological optics with Keppler, who furnished the mathematical proof a century later. Leonardo made a magnificent series of anatomical drawings from dissections made by Antonio Marco, and these led John Hunter to assert that he was the best anatomist and physiologist of his time, and, with his teacher, the first to rouse the true spirit in the study of anatomy. The physiology of movement attracted his artistic attention, and he explained walking, quite in the sense of modern physiology, as a constant falling forwards. The function of the heart as a pump to drive the blood into the arteries was established by him a hundred years before Harvey's complete discovery of the circulation. In Professor Bayliss's *Principles of General Physiology* there is a copy of a drawing of the anatomy of the vascular system with a reproduction of his mirror writing; it has sometimes been thought that Leonardo was left-handed, but Dr. Hemmeter believes that he was ambidextrous, and others suggest that he adopted the mirror writing as a protection against ecclesiastical interference. Leonardo's history presents some features interesting to the student of the conditions that lead to the production of human genius, for he was the illegitimate son of the husband of four wives and was brought up with eleven legitimate children, none of whom showed any sign of genius or artistic talent. Nothing is known of his mother, but it is possible that genius had remained latent on her side for generations. Leonardo's father was 23 years of age at the time of his distinguished son's birth; this is a striking exception to the general conclusion of Casper L. Redfield's laborious investigation—namely, that, as a rule, great men are the sons of fathers who average 40 years of age at the birth of their eminent sons.

[1] J. C. Hemmeter: *Annals of Medical History*, New York, 1921, iii, 26–44.

RED FATIGUE.

AN instructive paper by Dr. Edridge-Green on the effect of red fatigue on the white equation[1] should be studied by those who are interested in the rather abstruse question of colour vision. The white equation is the amount of pure spectral red, green and violet required to match a simple white. The author used an apparatus of the Abney type, with modifications suggested by Captain Fulton; with this apparatus portions of the spectrum are passed through slits, and are recombined on a white surface by means of a lens. The experiments are performed in the dark and stray light is excluded. The wave lengths of the three lights are given; in making the equation, the red and violet slits are kept unaltered, while the amount of green passed through is varied by opening or closing the green slit. It is stated that the equation is easy to make, the mean deviation being very small; the size of the portion of the spectrum in the green for the normal equation being equal to thirteen scale divisions. The light used for the red fatigue allowed red rays of a length of from λ 630 $\mu\mu$ to the end of the red end of the spectrum to pass. Edridge-Green gives the results of observations conducted on himself and on others; his results, put shortly, show that after red fatigue only about half as much green is required in the equation; in his own case, after five seconds' red fatigue, the green in the equation was exactly halved. In any experiments of this nature, it is essential not to allow the red fatigue to be too great, or a blue-green after-effect is obtained, which will prevent correct observations being made. In conclusion, the author insists that the results of his experiments are quite inconsistent with the three-sensation theory. The white equation and its match cannot, he contends, be due to similar physiological processes, or both would change in the same ratio.

[1] Proceedings of the Royal Society, B, Vol. 92. Communicated by Professor W. M. Bayliss, F.R.S., April, 1921.

THE PULSE RATE IN YELLOW FEVER INFECTION.

IN his thirteenth instalment on the etiology of yellow fever, a subject which he has for some time been investigating in America, Noguchi collaborates with A. E. Cohn[1] in an electrocardiographic research into the behaviour of the heart in the experimental infection of guinea-pigs and monkeys with *Leptospira icteroides*, the organism obtained from yellow fever patients, and also for purposes of comparison with *Leptospira icterohaemorrhagiae*. In man the pulse rate in yellow fever tends to be slow in the early stage and in the second stage, in which it may fall to 30 to 40 beats per minute, and may continue to be slow during convalescence; in fatal cases in the final stage it may be either rapid or slow. After death cardiac lesions are not constant, except perhaps the degenerative changes and frequent endocardial and pericardial ecchymoses associated with fever. In icterohaemorrhagic jaundice, formerly known as Weil's disease, the pulse rate is usually slow in proportion to the temperature, and this even in the cases without jaundice. In Cohn and Noguchi's investigation electrocardiographic records were taken before and after the inoculation of the animals with *Leptospira icteroides* and *L. icterohaemorrhagiae*, and thus the pulse rate could be accurately counted and the mechanism of slowing analysed. Slowing of the heart occurred during the febrile periods of both these experimental infections and in all cases until the day of death the mechanism of the slowing was of a simple variety—a slowing of the whole heart depending on the sinus, the pacemaker of the heart. On the day of death, although increased length of the auriculo-ventricular interval occurred, incomplete heart-block was noted on only one occasion.

ILLICIT TRADE IN COCAINE.

IN an article discussing the subject of dangerous drugs and the Opium Convention on August 27th we said that there was reason to fear that smuggling was widely spread, and it was pointed out that as long as any country produces and distributes tons of these perilous drugs irrespective of their legitimate destination, avenues of illicit traffic will be available, and police courts and inquests will periodically disclose what is but a fraction of the evils brought about by the abuse of these narcotics. We are accustomed to finding Germany the evil genius of Europe, and if one quarter of what Dr. Courtois-Suffit recently alleged before the Académie de Médecine is true it would be difficult to find words too strong to condemn the part now being played by German speculators in the clandestine distribution of cocaine. Dr. Courtois-Suffit, who is a medical expert attached to the Paris courts, gave, in conjunction with his house-physician, M. René Giroux,[2] a long account of the increase in this clandestine commerce; he stated that large quantities are smuggled in from Germany by French and American soldiers of the Army of Occupation, who reach France on leave or on demobilization. They seem to be able to get it through the Customs without much difficulty, and easily find purchasers not only in Paris, but at Nice, Monte Carlo, Marseilles, and Biarritz. A number of seizures have been made, and, according to Dr. Courtois-Suffit, the drug, as a rule, bears the label of Merck of Darmstadt. In one case a demobilized soldier stated that a German he met sold him a kilogram of cocaine for 600 francs; in France the soldier was offered 13,000 francs, but the bargain was not completed before he was arrested. In another instance a French dealer in Paris bought 14 kilograms from an American sergeant at the rate of 200 francs a kilogram, and was selling it at 10 to 12 francs a gram. It was calculated that he had made a profit of about 130,000 francs. The prices at which cocaine is said in these instances to have been sold in Germany are extraordinarily low; 600 francs at present day rates would be equivalent to about 3,500 marks, and 200 francs to about 1,200 marks. The most recent list issued by Merck we have been able to consult is dated December, 1920; cocaine hydrochloride was there priced for export at 8,000 marks a kilo. On the other hand, owing to the tightening up of regulations in other countries, the amount exported through legitimate channels may have diminished, and holders of large stocks in Germany may be anxious to get rid of them even at very low prices. However this may be, Dr. Courtois-Suffit seems confident of his facts, which have been ascertained during inquiries conducted by the French law courts. He is therefore justified in arguing that when such immense profits are possible a fine—which under the present law cannot exceed 10,000 francs—is useless as a deterrent. The fines actually inflicted are very much smaller, and imprisonment, which can be imposed in addition to a fine, is very seldom undergone. Dr. Courtois-Suffit urges that the French law should be amended to render the punishment more severe, and that greater care should be taken at the Customs; but he has to admit the difficulty, owing to the small bulk of the drug, of preventing smuggling, and says, moreover, that a certain amount of cocaine is brought to France by aeroplane. As was pointed out in our article of August 27th, national action, if isolated, is not likely to have the desired result. So long as cocaine, for example, is manufactured in excessive quantities unscrupulous dealers will find a means of smuggling so portable a drug. The action must be international, and the preliminary investigation suggested by Mr. Wellington Koo, the Chinese Minister, seems to be a step in the right direction. The council of the League of Nations has, at his suggestion, decided to ascertain approximately what are the amounts of opium, morphine, cocaine, and the other drugs enumerated in the Convention, which are in fact required for legitimate medical purposes.

[1] A. E. Cohn and H. Noguchi, *Journ. Exper. Med.*, Baltimore, 1921, xxxiii, 683-692.
[2] *Bull. de l'Acad. de Méd.*, June 21st, 1921, p. 720.

TREATMENT OF LEPROSY.

AT the request of the Surgeon-General of Trinidad, made through the American Consul in that island, the Surgeon-General of the United States Public Health Service has, with the consent of the Treasury Department, undertaken to send to Trinidad a quantity of the chaulmoogra oil preparation used by that service for the treatment of leprosy. The amount to be supplied will be sufficient for 500 treatments. The courtesy of the United States Government departments concerned must be freely acknowledged; but the fact that the Government of the United States was applied to by the medical authorities of an important British colony for this assistance appears to show that there is something lacking in the relations between the colonial medical authorities abroad and at home, and in the co-operation between the different British Government departments, more particularly as the researches on the therapeutics of chaulmoogra oil in leprosy have been largely carried out by distinguished officers of the Indian Medical Service.

PROVIDENT HOSPITAL SCHEME FOR LONDON.

THREE of the large metropolitan teaching hospitals—the London Hospital, St. Thomas's Hospital, and the Royal Free Hospital—have decided to offer their services to members of the National Provident Scheme for Hospital and Additional Medical Services, and this scheme will come into operation in London on November 1st next. The London scheme is based upon the Sussex scheme, of which an account first appeared in the BRITISH MEDICAL JOURNAL of January 22nd, 1921, p. 129. Its aim is to offer to those who come within certain prescribed limits of income, as well as to all those insured under the National Insurance Acts, the higher resources of medicine free of charge beyond payment of their annual subscriptions. The number of members will be limited; applications from those wishing to participate will be dealt with in the order in which they are

received until it is necessary to close the list. The Organizing and Executive Committee of the scheme consists of Sir Arthur Stanley, Lord Dawson of Penn, Sir Alan Anderson, Mr. McAdam Eccles, and Mr. J. F. Gordon Dill (Honorary Secretary). A leaflet giving in outline the scope of the scheme and the facilities offered, together with an extract from the rules, may be obtained on application to the Honorary Secretary, 77, Cambridge Terrace, Paddington, W.2. The Committee, believing that the public are determined to save the voluntary hospital system, launches the London Provident Scheme in the expectation that it will be welcomed, and that its extension to other parts of the country is only a matter of time. They are assured that wherever the scheme attracts a sufficient membership the financial anxiety of the London hospitals will be considerably lessened. It will afford, also, to those in receipt of small but regular incomes a means of providing during health for the expense of illness.

TRYPANOSOMIASIS.

WE are informed by the Colonial Office that the Tropical Disease Prevention Association is sending out a mission under Dr. Claude H. Marshall, a Senior Medical Officer in Uganda, whose services are being lent by the Government of Uganda for that purpose, to investigate certain methods of treating trypanosomiasis. Dr. Marshall first described in the BRITISH MEDICAL JOURNAL of May 22nd, 1920, his treatment of sleeping sickness by combined intravenous and intrathecal injections of organic arsenical preparations. Further reports on this subject by Dr. Marshall and Dr. S. M. Vassallo and by Professor J. W. H. Eyre and Dr. Marshall appeared in our issues of May 28th and August 20th, 1921.

CONGRESS OF THE HISTORY OF MEDICINE.

AT the second Congress of the History of Medicine in Paris last July it was agreed that the third Congress, to be held in July, 1922, should take place in London. There will be a meeting for business purposes towards the end of this year in Paris, which will be attended by Dr. Charles Singer, President of the Section of the History of Medicine of the Royal Society of Medicine, when the permanent organization of the Congress will be discussed. A meeting of the Section of the History of Medicine at 1, Wimpole Street, will be held on Wednesday, October 5th, at 5 p.m., to forward the arrangements for the London Congress of 1922, and to this meeting all those interested in the matter are invited, whether Fellows of the Society or not.

EPSOM COLLEGE.

SEVERAL Council exhibitions will shortly be awarded at Epsom College to the "sons of such duly qualified medical men as shall in the opinion of the Council be among the less fortunate members of their profession." Holders of these exhibitions pay only 50 guineas a year instead of the usual fee of 100 guineas. "France" Pensions of £30 a year will also be awarded to several medical men, not under 55 years of age, whose income, independently of any allowance from the College, does not exceed £100 a year. Forms of application can be obtained from the Secretary, Mr. J. Bernard Lamb, 49, Bedford Square, W.C.1, and must be returned to the office by Friday, September 23rd.

WE much regret to announce the death of Dr. T. Arthur Helme, consulting surgeon to the Manchester Northern Hospital for Women and Children, who was a prominent member of the Council of the British Medical Association and President of the Lancashire and Cheshire Branch.

THE programme has now been issued for the meeting of the British Orthopaedic Association at the Shropshire Orthopaedic Hospital, Oswestry, on September 24th and 25th. Visitors will be shown round the hospital and Sir Robert Jones will hold an out-patient clinic; there will be a number of demonstrations and visits to after-care centres. On September 25th operations will be performed by the honorary staff.

England and Wales.

REPORT OF THE METROPOLITAN ASYLUMS BOARD.

THE Report of the Metropolitan Asylums Board for 1920–21, which has just been published, states that from present indications a very heavy seasonal rise in infectious diseases may be expected during the autumn and winter.

Infectious Diseases.

The last annual report contains particulars of the exceptional increase in the number of cases of infectious fevers admitted to the Board's hospitals during the autumn and winter of 1919–20. The increase continued to be very marked throughout the year 1920. The number of patients admitted during the year was 35,916, and at the end of the year there remained 7,465 patients under treatment in the hospitals. Admissions were 13,954 more than in 1919, and the number remaining under treatment at the end of the year was 2,675 more than at the end of the previous year. The lowest number under treatment at any time was 3,512 on July 2nd, 1920, and the highest 8,669 on November 23rd. The number of diphtheria cases received was 10,636, and the number of cases of measles 526.

The serious epidemic in the autumn of 1920, which was the largest epidemic with which the Board has had to deal in its history, required unusual efforts by the medical and nursing staffs to meet successfully the unprecedented demands which that epidemic made upon the infectious hospitals. A special report of the measures then taken is included in the present report; this was issued by the Infectious Hospitals Committee last February, and was dealt with in our issue of March 5th (p. 361). After reaching its highest point at this period, the number of patients under treatment did not fall as rapidly as was anticipated, the lowest number (including tuberculous patients in the fever hospitals) reached up to the date of the publication of the present report being 5,755 on June 10th, 1921, when the figure again began to rise. In this connexion the following comparative figures are instructive:

Seasonal Rise.	Highest Number under Treatment and Date.	Minimum to which Numbers Subsequently Fell and Date.
1920–21	8,669 (Nov. 23rd, 1920)	5,755 (June 10th, 1921).
1919–20	5,210 (Dec. 21st, 1919)	3,739 (July 2nd, 1920).
1907–8 (previous highest seasonal rise)	7,158 (Nov. 19th, 1907)	3,283 (July 4th, 1908).

In the metropolitan area 43,958 cases of infectious disease (exclusive of whooping-cough and zymotic enteritis) were notified during the year 1920, or 16,640 more than in the previous year.

The number of cases of small-pox admitted to the hospitals of the Board during the year 1920 was 50, but only 20 of these cases came from the metropolitan area; there were 7 deaths. The medical superintendent of the small-pox hospitals reports that five separate outbreaks occurred in London: at the 3rd London General Hospital, Wandsworth, in Poplar, in Stepney, in Erith, and at the Seamen's Hospital, Greenwich.

Venereal Diseases.

The Board has been concerned with the treatment of venereal diseases in London since 1917, and in June, 1920, a new hospital of 52 beds was opened at Sheffield Street, intended not for the prostitute class, or for persons who had been convicted in police courts for soliciting or other offences, but for girls who had followed soldiers from the country, or who had been infected as the result of an occasional lapse into immorality. It was thought that the girls in question would be found in poor lodging houses and would be willing to go to an institution for treatment and remain there for some time, though there would be no power of detention, and that when cured they would, for the most part, go home and return to normal life. The results of the medical work were satisfactory when the patients were willing to avail themselves of the treatment and to remain for the period necessary; there is ground for the belief that good work, both medically and socially, has been done in many cases, though it

became apparent that the class of case received has not been that which the Board expected. At the same time there is no doubt that accommodation should be available for the type of women who have come to this hospital, however hardened; but Sheffield Street Hospital, situated as it is in the most central part of London without any grounds at all, seems hardly a suitable place in which to carry on this work.

Tuberculosis.

By the National Insurance Act, 1920, "sanatorium benefit" ceased on May 1st, 1921, to be included among the benefits conferred by the Act of 1911, and the arrangements entered into by the Metropolitan Asylums Board with Insurance Committees have come to an end. The London County Council recently estimated that the total number of beds required for London for the treatment of tuberculosis is 2,550; the provision actually made by the Metropolitan Asylums Board has been 2,154, with 883 additional beds available for children. The total number of tuberculous patients under treatment in the institutions of the Board was 2,148 (on March 31st, 1921).

Mental Hospitals.

The number of patients in the Board's mental institutions for the year 1920 were as follows:

Remaining on January 1st, 1920	5,446
Discharged during the year	188
Died	594
Admitted	875
Remaining on December 31st, 1920	5,539

The average annual number of admissions during the past ten years has been 985. Of the patients admitted, 499 were under 16 years of age, 93 of these being under 5 years of age. Of the 376 admissions over 16 years of age, 195 were between 70 and 80, 85 between 80 and 90, and 3 over 90.

Finance.

The total expenditure of the Board for the year amounted to £1,872,013, which is equal to a rate of 9.86d. in the pound. The expenditure in the principal departments was as follows: Infectious hospitals, £712,941; mental hospitals, £519,928; children's institutions, £187,185; tuberculosis institutions, £153,740. This expenditure, which falls principally under the headings of food and other supplies, salaries and wages, and up-keep of buildings, has risen with the increases of cost under each of these headings throughout the country, but the estimates for the financial year 1920–1921 do not entail any further increase.

Scotland.

THE THIRTEENTH CENSUS OF SCOTLAND.

IN 1801, when the first official census of Scotland was taken, the population numbered 1,608,420; since then a census has been taken every ten years, and each has shown an increase in the number, the stages on the upward path being 1821, when the population exceeded 2,000,000; 1861, when it exceeded 3,000,000; and 1891, when it rose above 4,000,000. It is now (on Census day, June 19th, 1921) within a hundred thousand of 5,000,000, being 4,882,288. The intercensal increase, however, is the smallest which has occurred, and is only 121,384; the previous smallest (173,552) was recorded in 1861. But the diminished growth of population is more clearly shown by the intercensal rate of increase, which was only 2.5 per cent.; this contrasts with a previous lowest of 6 per cent. in 1861 and of 6.5 per cent. in 1911; in most of the other decades the rate was above 10 per cent. A marked drop in the intercensal rate of increase is, then, the first outstanding feature in the Census returns. In England and Wales the intercensal rate of increase was 5.03 per cent.

The second feature is the increase in the excess of females over males. The male population numbered 2,348,403, and showed an intercensal increase of 1.7 per cent.; the females numbered 2,533,885, with an intercensal rate of increase of 3.3 per cent. North of the Tweed, therefore, the excess of females over males was 185,482, and was greater than the excess ascertained at any previous Census, the only one approximating to it being that reported in 1861. From 1861 to 1901 the rate of excess was a falling quantity; but in 1911 it had begun to go up again, and, as has been stated, in 1921 the upward tendency is unprecedented. In England and Wales, with a total population of 37,885,242, the excess of females over males was 1,720,803. In Scotland at present there are about 1,090 females to 1,000 males, and in England and Wales about 1,095 females to 1,000 males. In Midlothian the excess of females was at its highest, being 36,430; in Edinburgh the surplus was 36,181, whilst in Glasgow—with a total population of 1,034,069 as against Edinburgh's 420,281—it was only 24,979.

The third outstanding feature in the Census returns is the massing of the population in certain areas. For instance, Glasgow contains 21.2 per cent., or more than a fifth of all the people in the country; Lanark, with 1,539,307, has almost a third of the entire population; and Midlothian, with 506,378, has about a ninth. The tendency to crowd into the towns continues, and the country districts are becoming more and more empty; the Highlands in particular are suffering, and the six chief Highland counties, which contained over 471,000 persons in 1851, now contain only 401,000, the decrease in the last decade having been 10,000. With this has to be conjoined the decline in the use of the Gaelic language; there are now 10,314 persons speaking Gaelic only, as compared with 18,400 in 1911, and there are now 151,159 speaking both Gaelic and English, as compared with 183,998 in 1911, and the decline has been steady during the last thirty years. The total number of persons returned on the schedules as entitled to medical benefit under the National Insurance Acts was 1,619,202, of whom 1,123,513 were males and 495,689 females.

More details are necessary before the various influences which have led to these changes in the population of Scotland can be defined; but four, at any rate, seem to have been at work—namely, a falling birth rate, the losses chiefly amongst the males due to the war, arrest of emigration during the war, and increase in the number of marriages, and recently in the birth rate, since the war; the first and second influences will to some extent have been counteracted by the third and fourth. It is an interesting fact that this Census has been carried out during the occupancy of the Registrar-Generalship of Scotland by a medical man—namely, Dr. J. Craufurd Dunlop.

RARITY OF SECOND ATTACKS OF WHOOPING-COUGH EPIDEMIC.

The Scottish Board of Health has received a report from Dr. Shearer, one of its medical officers, who visited St. Kilda on August 23rd to inquire into an outbreak of whooping-cough, of which word was received by wireless from the ss. *Dunara Castle* on August 19th. Dr. Shearer found that cases of whooping-cough had occurred on the island towards the end of July, and that in all but one of the seventeen inhabited houses whooping-cough was present, the exception being that of Nurse Mackenzie, who had only returned to the island with her two boys the night preceding his visit. Cases were to be seen in different stages of the disease from the late catarrhal to the late paroxysmal, but no one was seriously ill, and in no case was there any complication. There was a similar epidemic on the island twenty-nine years ago, and, so far as the present epidemic is concerned, there is a clean line between those above and below the age of 29 years. Not one person over that age has developed whooping-cough, but of the forty inhabitants under that age all but four are sufferers from the disease. These four are the nurse's two boys and a little girl, all of whom had just returned from a holiday on the mainland, and a young woman, aged 27, who had whooping-cough when on the mainland several years ago. This would appear to be strong proof of the rarity of second attacks.

Ireland.

DUBLIN MILK SUPPLY.

THE Public Health Committee of the Dublin Corporation, appointed in conjunction with six members of the Council to report on the milk supply and prices, has issued its report, in which the establishment of municipal milk depôts is recommended as a possible solution of the difficulty. The Committee states that inasmuch as the representatives of the Dublin Cowkeepers' Association

submitted details of working expenses, which alleged that the cost of production of their supply totalled 2s. 3½d. a gallon, the Committee secured information that milk was supplied at 2s. 2d. a gallon by a vendor who purchased milk in the Drumcondra area, and that the Dublin Union and other large consumers were purchasing milk at 1s. 10d. a gallon, supplied by members of the Cowkeepers' Association, and is convinced that these circumstances prove that the figures submitted as to the cost of production are not reliable. While regretting that reliable information could not be obtained to enable it to fix a fair price, the Committee in recommending the establishment of municipal milk dépôts points to the success of such a policy in relation to other local authorities.

In Portrane and Richmond Asylums the Committee found that the cost of production with paid labour was 9d. a gallon, and exclusive of patient labour 6d. a gallon. The contract prices to Dublin Union hospitals range from 1s. 6½d. to 2s. 5d. per gallon, and the prices paid by retailers of rail-borne milk range from 1s. 2d. to 1s. 6d. per gallon. The deputation from the Dublin Cowkeepers and Dairymen's Association submitted figures showing that with a capital invested of £1,200 the total cost for twenty cows for a period of twenty-six weeks was £837 15s., being a net cost per cow of £41 7s. 9d. On further investigation it was found that nine of the thirteen contractors to the Dublin Union were members of the association, and the contract price ranged from 1s. 6½d. to 1s. 10d. a gallon. A return of the prosecutions showed that for twelve months to June 30th, 1921, nineteen members of the association had been proceeded against, and since that date up to August 23rd ten cases were pending.

The Committee ascertained from the manager of the Plymouth Co-operative Society, Limited, which had the reputation of supplying milk to that city very efficiently and economically, that up to the middle of July the society purchased its supply at 1s. 4d. a gallon, and distributed it to customers at 2s. 4d., and from the middle of July to the end of September their purchasing price is 1s. 8d. a gallon.

Correspondence.

CAPILLARY PRESSURE.

SIR,—In his letter (August 13th, p. 259) Dr. Gillespie ascribes views to me which I have never maintained, and then proceeds to abuse—a common method of attack, and one which requires an answer only in so far as to prevent some readers from mistaking Dr. Gillespie's dogmatism for scientific truth. I have never failed to realize the obvious fact that there must be a greater pressure inside than outside the capillaries in order to maintain patency, but what I do maintain is that the difference of pressure is very small.

When the skull is trephined and the dura mater incised the brain bulges into the trephine hole. A tube filled with water is screwed into the trephine hole, covered at its cerebral end with thin rubber, and connected at its other end to a manometer and pressure bottle. An air-bubble index is introduced into the glass part of the tube beforehand. The air bubble is forced outwards by the pressure of the brain against the rubber membrane. It pulsates with each heart beat and respiration. It can be brought back to the zero position by raising the pressure bottle, and the manometer then indicates the brain-pressure. Such is my brain-pressure gauge described twenty-five years ago. Now the pressure of the brain is circulatory in origin; it ceases the moment the heart is stopped. It is the pressure left over after the arterial pressure has expanded the arteriole-capillary-venous network. The pressure in the brain pressure gauge overcomes the systolic expansion of the brain and pushes the brain back into its normal position. Now be it noted that the least rise of venous pressure increases the pressure of the brain and tends to expand it. Such expansion is seen in the anterior fontanelle of the crying infant. In the torcular Herophili, a bony cavity in the dog, a tube can be screwed in so as to measure the cerebral venous pressure. This pressure and the brain pressure closely agree, and the least rise of cerebral venous pressure raises the brain pressure. Therefore I am right in assuming that the cerebral capillary and venous pressures are very close together. Such a conclusion is borne out by the fact that the pressure of the blood escaping from a cut in the finger is close to that measured directly by the insertion of a hollow needle into a vein of the arm. The bleeding finger with severed capillaries, arterioles and venules is pushed into a tube connected with a manometer and the hollow needle in the vein is connected with another manometer. Both measurements are here direct.

The Roy and Graham Brown method applied to arterioles, capillaries, and venules in transparent tissues gives me similar readings to the direct method, just as the armlet sphygmomanometer gives readings of arterial pressure very closely approximate to direct readings taken with cannula in the artery and manometer. The Roy and Graham Brown method has shown me that when the heart is stopped it takes the least pressure (1 to 2 mm. Hg) to drive the corpuscles along the capillary vessels as quickly as they move in the natural conditions of the circulation. We cannot justly ascribe results obtained with glass capillary tubes and viscous fluids to living tissues. The comparison made by Dr. Gillespie of the physical conditions pertaining to garden-hose pipes, hypodermic syringes and needles with these conditions existing in the blood vessels is unwarrantable. The relation of capillary wall to blood may be, and probably is, such that frictional resistance is reduced to the least possible amount—to that of one layer of oil slipping over another. Dr. Gillespie says that to force the blood through there must be required a considerable difference of pressure between arterioles and venules. There is no "must" about it, and my observations show that very little pressure indeed is required.

When the Roy and Graham method is used on the frog's web the capillaries at the edge of the web first are compressed, corpuscles ceasing to pass through them, then those further in, and so on as the pressure rises, until the arterioles are compressed.

It is just to assume that the pressure in the compressed vessels rises to that in the vessels which feed them. In the case of the capillaries at the edge of the web, this pressure is that in the capillaries a little further in. As I pointed out in my first letter in answer to Dr. Gillespie, if the internal tension of the capillaries was considerable—like that of a soap bubble—these vessels would empty themselves into the veins when the heart is stopped. This is not the case. There is, of course, a difference of tension between the inner and outer surface of a capillary, but this is so small as to be negligible. Let Dr. Gillespie get out of his armchair and proceed by experiment to prove the opposite which he so dogmatically asserts. His criticism of Dr. McQueen for writing "kinetic energy" in place of "that pressure which maintains kinetic energy," is a quibble. The meaning was plain.—I am, etc.,

Loughton, Aug. 25th. LEONARD HILL.

SIR,—Dr. Henderson (August 20th, p. 301) accuses me of "ascribing to Professor Leonard Hill views, statements, and assumptions which the latter has never made." The only ground for this sweeping statement, that I am aware of, is the omission by me (July 16th, p. 96) of the word "practically" in a quotation from Dr. Hill, which omission was pointed out by Dr. McQueen (July 30th, p. 171). I had no intention of misrepresenting Dr. Hill in the matter, and quoted the same passage again (August 13th, p. 259) including the word "practically," and showing why this word was needed when one was speaking of arteries and not when speaking of capillaries.

In the second paragraph of his letter Dr. Henderson asks, "If the pressure within the veins of the eye is greater than that outside their walls, how does Dr. Gillespie expect the aqueous to drain into the venous sinus of Schlemm's canal?"

My reply is that the pressure in Schlemm's canal is less than that in the anterior chamber, and that when Dr. Henderson speaks of "the veins of the eye" he seems to forget that there are veins and veins in the eye. There is no flow from Schlemm's canal into the retinal veins nor into the venae vorticosae of the choroid, in both of which comparatively high pressure is required to maintain their patency against intraocular pressure.

The only veins into which there is a flow from Schlemm's canal are the anterior ciliary veins, which lie outside the

sclera, and in which therefore the pressure required to keep them open is only a little greater than atmospheric pressure. That the direction of the flow is as stated above has been shown by injection of colouring matter into the aqueous, and subsequent examination of where the colouring matter had penetrated to. See the *Encyclopédie Française d'Ophthalmologie*, 1905, p. 139.

Hence there is no question of uphill flow, and Dr. Henderson's sneer at equations and formulae is uncalled for.—I am, etc.,

Knock, Belfast, Aug. 23rd. JOHN R. GILLESPIE.

THE FORMOL-GEL REACTION IN SYPHILIS.

SIR,—The experience of Mr. Murray Stuart (August 13th, p. 263) in relation to the uselessness of the above test is similar to our own in this laboratory.

Professor Beattie and I examined some sixty serums with this method and controlled them by the Wassermann reaction. In the Wassermann test we obtained double positive, positive, and negative results, but the formol-gel method gave negative results in all cases. A few of the tubes seemed to show a more or less solid column, but this was purely a surface tension phenomenon, for on shaking the tubes the fluid nature of the contents was at once obvious. The tubes showing the apparent increase in viscosity did not correspond to the serums giving positive Wassermann reactions.—I am, etc.,

F. C. LEWIS,
Assistant Lecturer in Bacteriological Methods, University of Liverpool.

August 23rd.

AUTO-SERUM IN THE TREATMENT OF DISEASE.

SIR,—I have seen lately in the lay press a reference to a method of treatment for cancer which is ascribed to Dr. Caudier of Paris. This is said to consist in the injection under the skin of serum derived from the patient's own blood, which presumably contains substances which, when thus reintroduced into the system, strengthens its defence against cancer. It is apparently claimed by Dr. Caudier that the effect is rapidly to improve the general condition of the patient, and to reduce the size of the tumour.

I have not observed any allusion to this method of treatment in any recent medical periodical, but in an address on "The specificity of cancer and the general principles of its treatment and prophylaxis," which I delivered to the East Yorks Branch of the British Medical Association, and published in the *Lancet* of May 28th, 1910, I made the following statement:

"On the other hand, should the causal agent be found to be a bacterium, success may follow the exhibition of a cancer vaccine, prepared after the methods of Wright; or of an anti-cancerous serum. Until such serum can be procured from an individual cured of, or rendered immune to, the disease, *the effect of auto-serum might be tried*. This may contain a self-generated antitoxin; or, if it contains the toxin itself, its injection in small amount may act as a vaccine and stimulate the leucocytes to increased phagocytic activity."

Although I confined myself to an abstract statement, without mentioning any concrete example (for a reason given later), I had in mind experiments made with auto-serum in 1907 and 1908, in cases of cancer occurring in my practice.

In September, 1907, a man, aged 67, was admitted to the Driffield Poor Law Infirmary suffering from disease of the left elbow. He said he had been discharged from a city infirmary in the neighbourhood as incurable, having refused offered amputation. His elbow presented the appearance of a huge fungating epithelioma, a mass covered with suppurating granulations, discharging freely and emitting a most vile odour. There was great pain present which prevented sleep.

I decided to experiment on this man by injecting auto-serum and explained to him what would have to be done, expressing the hope of relief if not of cure. He was as eager as myself to try this treatment, and gladly consented.

Ten c.cm. of blood were drawn from the right median basilic vein by a large antitoxin syringe and allowed to coagulate in a sterilized test tube. The serum was then poured off, centrifuged, and stored in 0.5 c.cm. ampoules and sealed up. The ampoules were then sterilized. On September 25th, 1907, 0.5 c.cm. was injected hypodermically into the posterior aspect of the right forearm, and a similar dose was given weekly until the supply was exhausted. Fresh supplies of blood were drawn as required and treated as before, and the injections were continued until twenty-three had been given, the last being given on February 23rd, 1908. After several injections there was marked improvement. Pain disappeared entirely and rapid diminution of the mass set in, the discharge gradually ceased, and by the time that the last injection was given only a few small granulations remained, the elbow being normal in size.

Though greatly elated by the success of this treatment I felt it desirable to make certain of the nature of the disease. A few granulations were detached and sent to the Clinical Research Society. To my great chagrin the report stated that the disease was tuberculous.

As my thoughts and efforts were concentrated upon the treatment of cancer, I was too greatly disappointed to care to report the successful result of the action of auto-serum in tuberculous disease, and it may be that further experiment by others will confirm my experience and that another weapon may be provided against a disease which is quite as malignant as cancer, or disprove it.

In several cases of undoubted cancer, in private practice, I attempted the same treatment, but in every case the patient refused to permit me to obtain a second supply of blood, and I was thus prevented from bringing my experiments to a positive or negative conclusion.

The fact that one was only a general practitioner was too heavy a handicap, but, in hospitals for cancer, with proper laboratory facilities, this method of treatment might be thoroughly tested, since at least some of the patients might be found to be as willing, in their own interests, to co-operate with the surgeon as my patient was. At the same time success is, in my opinion, only probable on the presumption that the parasite responsible for cancer is a microphyte and not a protozoön. In the latter case some mineral parasiticide is indicated such as is successful in syphilis. Molybdenum has not been tried, and if an oscol of this metal can be prepared I should be glad to experiment with it, and there is abundant material.—I am, etc.,

A. T. BRAND, M.D., C.M.,
Late Major R.A.M.C.

Driffield, E. Yorks, Aug. 8th.

CERVICAL RIBS.

SIR,—In an annotation in the BRITISH MEDICAL JOURNAL of August 27th, p. 332, on "Rib Pressure and the Brachial Plexus," the statement is made that "Sir William Thorburn in 1904 was the first in this, and, perhaps, with the exception of Borchardt, in any country to apply *x* rays in the diagnosis of a cervical rib."

In the BRITISH MEDICAL JOURNAL of June 8th, 1901, p. 1395, is a report on a case of cervical ribs by T. E. Gordon, F.R.C.S.I., illustrated by drawings from two radiographs of two cases. One case was radiographed for Mr. Gordon *before August 27th, 1899*, and a cervical rib found on each side.—I am, etc.,

Liverpool, Aug. 27th. C. THURSTAN HOLLAND.

VACCINE THERAPY AND CYSTITIS.

SIR,—The discussion on cystitis in the Section of Neurology at the Annual Meeting of the British Medical Association, Newcastle, reported in the issue of the JOURNAL for August 27th, p. 305, seems to call for some comment from one who—to quote the words of the opener—is sceptical as to the value of vaccine therapy (in cystitis), but who is, perforce, bombarded daily with specimens of foul urine, with urgent requests for a vaccine.

The real trouble is this, that the practitioner nowadays is apt to fly to a vaccine before submitting his patient to an expensive course of surgery and radiology. In this he is wrong from the scientific point of view, and I venture to say that no responsible pathologist would suggest a vaccine for the treatment of a bacterial infection of the urinary tract (I dislike the limitation "cystitis") until investigation into its cause had been made. Personally I always either refuse to make a vaccine at all or point out that it will be useless unless it is regarded as an adjunct to, and not a substitute for, accurate surgical diagnosis. But vaccine may be bought from a shop, though consequent discredit of vaccine therapy as a science not infrequently follows. I think that pathologists should refuse to supply a stock vaccine without bacteriological examination of the patient and some knowledge of the clinical history of the case.

It does not, however, follow that vaccines are useless in urinary infections. Provided they are made from the organisms responsible for the infection—and here the serum-resisting test is of great value—and are used concurrently with, and not as a substitute for, diagnosis, the disinfection of the tract is in many cases accelerated by their employment.

The essential factor lies in consultation on the individual case between the surgeon and the pathologist, each being anxious to assist and not supplant the other.—I am, etc.,

London, W.C., Aug. 29th. A. KNYVETT GORDON, M.B.

A RETROSPECT OF NATIONAL INSURANCE.

SIR,—In your leader of August 20th, p. 291, while discussing Dr. Alfred Cox's communications to the American Medical Press upon the subject of national health insurance, with reference to the procedure adopted under the Act to deal with excessive prescribing, you state that Dr. Cox does not believe that "the procedure has deprived a single insured person of any drugs really necessary for his treatment; but the system evidently does not favour 'elegant pharmacy' or luxury in prescribing."

I think it very unfortunate that these should be the opinions of one who carries the weight and exerts the influence of Dr. Cox; there must be few medical men working the Act but must challenge his first statement. The procedure adopted to deal with excessive prescribing is the one outstanding defect in the administration of national health insurance; and, with all respect to the weighty opinion of Dr. Cox, this procedure is responsible for the belief—the justifiable belief—amongst insured persons that there is such a thing as "insurance medicine," and that this medicine is of a very inferior type, from every point of view, when compared with "medicine for private patients."

The question raised is one for very serious consideration, and one which some of us will do our utmost to ventilate before the Committee which the present Minister of Health proposes to set up to consider the present administration of the Act. Looked at from the point of view of the patient, the procedure has led to a system of prescribing which, if it excels in simplicity, does not enhance the reputation of the medical art as a healing art. To use such terms as "luxury in prescribing" and "elegant pharmacy" in the half-sarcastic, deriding fashion of Dr. Cox is to cut at the root of one of the most important, if not the most important, qualification of the efficient physician. When one is really ill, as some of us know from bitter personal experience, a pleasant medicine of the kind classed by Dr. Cox as "luxury" often makes all the difference to the patient; the illness becomes more easy to bear, less prolonged, and one of its most disagreeable features—the swallowing of a disgusting medicine, its disagreeableness enhanced, and prolonged by the state of the mucous membrane of the mouth—is avoided.

The procedure which Dr. Cox favoured with his benediction is responsible, in many cases, for a class of treatment which is little less than a scandal. Medical practitioners are coerced by the fear of being surcharged into a routine method of treating insured persons. I was told recently by a well-known physician from the North of England that it was an ordinary thing to find forty to fifty men being brought before the Panel Committee for over-prescribing, and surcharged. By another I was told that the Glasgow Insurance Committee saves thousands of pounds in the year by this process of surcharging. Does Dr. Cox really believe that such procedure adds to the dignity of the profession, to the self-respect of the general practitioner, or in the end makes for efficient prescribing? It is too big a question to discuss in such a letter as this, but a careful study of the question, and the institution of inquiries in many different parts of the country has led me to the conclusion that the average Panel Committee is quite unfitted to deal with this matter; in the large majority of cases gross injustice is done to men who prescribe conscientiously in the best interests of their patients. The average medical man simply has not time or inclination to appeal against these unjust decisions; takes a simpler method of dealing with the matter, and the patient suffers. In this county we are fortunate in possessing a Panel Committee and an Insurance Committee who look upon this matter from the broad point of view of the interests of the insured and doctors alike, and we have never been forced to surcharge any practitioner. The Insurance Committee agrees with the Panel Committee that the procedure is a most vicious one. It strikes one as extraordinary when one reads of the proceedings of these Insurance Committees all over the country to note the suspicion, distrust, and antagonism of the officials and lay members towards the doctors, and their readiness to make grave charges upon what, on investigation, turns out to be mere trivialities. There is no doubt but that the procedure of Panel Committees in dealing with over-prescribing fans this flame of antagonism and suspicion. Is it not natural that a committee of laymen, ignorant of disease and its treatment, should look with suspicion upon a system in which medical men fine one another to the extent of thousands of pounds for treating over-generously their patients in the course of treatment? Panel Committees who take their duties lightheartedly without considering the broader issues at stake, are weaving a rope to strangle the profession.

To possess the art of prescribing elegantly and efficiently is to possess the highest qualification for general practice. If it becomes a lost art it will shake the very foundations of Insurance Practice, reduce it to the level of Poor Law practice in the days of Oliver Twist, and for such a state of affairs none will have to shoulder greater responsibility than Dr. Cox, and those who, like him, uphold the present vicious procedure of dealing with over-prescribing.—I am, etc.,

Croit Mhàiri, Tain, Ross-shire, August 20th. ENEAS K. MACKENZIE.

CHRONIC INFECTIONS AND MENTAL ACTIVITY.

SIR,—As one who has been intimately connected with a medical school for many years I have been struck with the number of men of first-class ability, many of them consistently first of their year, who have either died of tuberculosis or have had to subordinate considerations of successful work to those of health. A critical survey of our hospital staffs, recruited for the most part from the best students, reveals the fact that many of them have suffered from infections of some sort—tuberculosis of bones, joints or lymphatic glands, appendicitis, gastric or duodenal ulcer, chronic rheumatism, colitis, and cholecystitis. So striking is this in one hospital that I know of that it has been facetiously remarked that it is a necessary qualification for a post on the staff that the applicant shall have had a major operation! The work of Lane, Rosenow, and others affords proof that the great majority of abdominal, and indeed of all, operations are the direct result of chronic infections.

Is it merely a coincidence, then, that such a large number of our best men show the results of chronic infections, and that so few of them live to extreme old age? It is, I think, a recognised fact in toxicology that many substances which are toxic in large doses act merely as stimulants when administered in minimal amounts. The immediate effect of a dose of tuberculin or other vaccine is similar to that produced, I am told, by a glass of good champagne. Literature is full of examples of lucid exposition and extraordinary heights of eloquence resulting from the moderate drinking of alcohol, and a very able student of my own time was in the habit of taking a hypodermic injection of strychnine before an important examination, apparently with strikingly good results. If we assume that in a case of moderate tuberculous infection small amounts of tuberculin are being continuously absorbed into the circulation, the effect would be a mild, but frequently recurring, stimulation of the brain and the brilliance of the after-dinner speaker produced, with this difference, however, that instead of spasmodic results the effect would be continuous. Might this not afford a reasonable explanation of the apparent incompatibility between robust health and intellectual attainment? No doubt there are exceptions to the theory implied in this supposition, and examples are to be found where a large brain accounts for exceptional achievement. Such examples will occur to anyone, though the big brain may be a doubtful blessing. Of the two biggest-brained schoolboys I have known, one became "soft" and had to be confined, and the other committed suicide by dividing his femoral artery with a pocket-knife. In general I should feel disposed to suggest that "brains" in the great majority of cases are not due

to mere size of cranial content (which is fairly constant), but rather to extraneous causes, one of which may be excessive stimulation by microbic toxins.

These reflections have an obvious bearing on the problem of preventive medicine. The abolition of acute infections—such as small-pox, typhus and typhoid fevers, scarlatina, etc.—can only be beneficial. It may be otherwise with the chronic infections. Conceivably their disappearance might result in the curtailment of human achievement, and in the sacrifice of short-lived brilliancy to long-lived mediocrity.—I am, etc.,

Belfast, Aug. 24th. S. T. IRWIN.

Obituary.

JOHN WARRINGTON HAWARD, F.R.C.S.,

Consulting Surgeon, St. George's Hospital.

THOSE acquainted with medical life in London in the years between 1875 and 1910 will hear with regret of the passing of a familiar and friendly personality. John Warrington Haward died on August 20th, at Manor End, near Berkhamsted, Herts, where he had lived for ten years since his retirement from the active practice of his profession.

Warrington Haward, who was the youngest son of the ten surviving children of James Haward, was born on November 13th, 1841, and was the grand-nephew of Francis Haward (1759–91), "engraver to H.R.H. the Prince of Wales." He entered at St. George's in October, 1860, and after a career prophetic of the future, as shown by his gaining the William Brown scholarship for three years and many prizes, qualified at the two Colleges in 1863, and in 1868 became F.R.C.S. He was house-surgeon at the Westminster Hospital (1864), and then for two years at the Hospital for Sick Children, Great Ormond Street, where he formed a firm friendship with the late Dr. Samuel Gee. In 1867 he returned to St. George's as demonstrator of anatomy, subsequently becoming surgical registrar (1870–72), curator of the museum and demonstrator of morbid anatomy (1873–75), assistant surgeon and surgeon to the orthopaedic department (February 24th, 1875–80), succeeding the late B. E. Brodhurst in the latter capacity, and full surgeon from 1880 till 1900, when, in accordance with the inexorable twenty years' rule, he automatically became consulting surgeon, though as a member of the weekly board he continued to take a most active part in the management of the hospital, being chairman of the Nursing Committee from 1904 to 1915. From 1870 to 1878 he was assistant surgeon to the Great Ormond Street Hospital for Sick Children, and he was on the staff of the Cripples' Nursery from 1874 to 1882, when he became consulting surgeon. The list of charitable societies and committees on which he served is too long to detail, but for thirty years he was closely identified with the Invalid Children's Aid Association, being chairman of the Executive Committee (1903–15); for twenty years (1898–1918) he was treasurer of the Society for the Relief of the Widows and Orphans of Medical Men.

His published work covered a wide field; in the seventies he was much interested in anaesthetics, writing six papers on the subject, including that on "Ether and chloroform as anaesthetics" in the fifty-fifth volume of the *Medico-Chirurgical Transactions*. *A Treatise on Orthopaedic Surgery* (1881) and *The Management of Invalid and Crippled Children* were the fruits of his early work on these special lines, whereas his paper in the *Medico-Chirurgical Transactions* for 1897 on irreducible hernia, with its analysis of eighty-five cases under his observation, gave the ripe experience of a general surgeon near the end of his active hospital practice. His Hunterian Lectures, given in 1906 at the Royal College of Surgeons of England, on phlebitis and thrombosis, may well, like the late Sir George Humphry's paper in 1859, have been inspired by his own sufferings. As a representative surgeon he naturally contributed to contemporary standard works, such as Timothy Holmes's and Hulke's *System of Surgery* (1879), Heath's *Dictionary of Surgery*, Quain's *Dictionary of Medicine*, and Latham and English's *System of Treatment* (1912). In addition to those already mentioned, he made many communications to the medical societies of his day, such as the Clinical Society (fifteen papers), of which he was honorary secretary and vice-president, the Pathological Society, of which he was also vice-president, and the then premier society, the Royal Medical and Chirurgical, where he passed through practically every office save that of honorary librarian, and was president when in 1907 it became expanded into the Royal Society of Medicine, in which he again was active in various ways, being at one time president of the surgical section (1908–09). It may be recalled that he was one of the first to describe the bony metastases of primary carcinoma of the thyroid. Among his less severely technical writings were "The employment of ladies in hospital nursing" (*Contemporary Review*, February, 1879), and the introductory address, "On liberty and authority in relation to medicine," at the opening of the winter session at St. George's Hospital Medical School on October 3rd, 1881.

Mr. Warrington Haward married in 1876 Amy Cecilia, daughter of James Nicholls, M.D., F.R.C.S., of Chelmsford, and later of Wiveliscombe, Somerset, and their exceptionally happy life in London was spent, as their friends well remember, at 5, Montagu Street, Portman Square, 18, Savile Row, and 57, Green Street. Mrs. Haward and two sons, the elder of whom, Lawrence, is in charge of the Art Gallery at Manchester, survive him. He was buried on August 23rd at Potten End Church, near Berkhamsted, Herts.

Sir HUMPHRY ROLLESTON writes: Mr. Warrington Haward was a cultivated and scholarly surgeon, much interested in literature and art, as is shown by appropriate references in some of his published papers and essays, and had a broad and philosophical outlook on life and his profession. Though a most capable operator, he was wisely conservative and safe rather than brilliant and daring in surgery. He was one of those unselfishly willing to undertake the laborious and somewhat thankless work of committees, treasurerships, and chairmanships. In addition to holding office as treasurer of St. George's Hospital Medical School for some years he was much in request at the Royal Medical and Chirurgical Society, of which he was in 1906 the last President, at the Royal Society of Medicine, and at an extraordinary number of medical and charitable bodies. An excellent man of business, he was an ideal member or chairman of a committee, for while holding an outspoken and impartial position as to what was right, his influence was always directed to soothing the acerbities and susceptibilities of advocates of policies who, often, no doubt, because they had vigorous convictions, presented their side of the question with some lack of tact and even of consideration for their opponents. By a timely conciliatory but firm speech he often turned the opinion of a meeting and thus left the happy feeling that the proper course had now been smoothly adopted. His delightful personality made him loved as well as respected, and his only failing, if such it be, was complete want of any faculty for self-assertion. This trait was characteristically shown by his directions that his funeral should be extremely simple, and it was thus in a beautiful Hertfordshire village that a few friends saw the final breaking of a valued link with the past.

Mr. STEPHEN PAGET writes: He was a good example to all of us; he was unselfish, courteous, honourable; one of the best men in our profession. If he had been more ambitious of his own advancement he would have gained more public recognition; but he was content to work quietly, and to give a great part of his active life in the service of all of us. He had more admirers than he knew of. He loved friendship and kindliness and sympathy. He had no enemies: it was not in him to make them. None of us who remember him can even imagine him suspicious of other men, or ungenerous, or glad to hear or to repeat things said against them; he was above all that; unfailingly gentle and charitable. In the later years of his life he had to bear the hardship of failing health and failing vision—a heavy burden for a man so fond of books, a thorough scholar of English literature. He bore this hardship bravely, and held on so long as he could to his work for us.

T. H. MORTON, M.D.ABERD.,

Sheffield.

BY the death of Dr. Thomas Henry Morton on August 26th the Sheffield Division of the British Medical Association loses its oldest member. He was born in Burmah in 1838, where his father was a British Commissioner. He received

his early education at Newark, and was then apprenticed to Dr. Slater of Bawtry. Later he passed to the old Sheffield Medical School, where he attended the prelections of Drs. Law, Favell, Jackson, Overend, and Bartolomé. He obtained the diplomas of M.R.C.S. in 1861 and the L.S.A. in 1862. For a time he acted as demonstrator of anatomy at his old school, and then entered general practice by acting as assistant to Dr. MacKinder of Gainsborough. In 1864 he settled in Brightside, Sheffield, and conducted a large practice in this area for nearly thirty-four years, retiring in 1898. He took the M.D.Aberd. in 1876.

A sound practitioner and a good surgeon of the old school he found time to keep himself acquainted with medical progress. His confrères held him in the highest respect, and honoured him in 1880 by making him President of the Sheffield Medico-Chirurgical Society. He contributed occasionally to medical literature. For many years he was a familiar figure at the annual meetings of the Association, which he used greatly to enjoy. He maintained his interest in medical affairs to the last.

Dr. Morton had many hobbies. He was a connoisseur and collector of old oak. His collection was justly admired, and was considered one of the finest in Yorkshire. An ardent disciple of Isaac Walton, he enjoyed nothing better than a day with the rod, incidentally picking up any piece of old oak which caught his fancy. He was an accomplished photographer, and was particularly successful with interiors of cathedrals and churches. During the great epidemic of small-pox in Sheffield in 1888 Morton made a fine collection of lantern slides depicting the various phases of the disease. He was the only Fellow of the Royal Photographic Society in Sheffield, and he was very proud of the fact. He was a churchman, and for many years took an active part in the work of St. Mary's Church. He was beloved by his patients, and his benevolence to his poorer patients was a marked trait in his character. He leaves a widow for whom much sympathy is felt. He had no family.

WE regret to record the death, on August 31st, at Kelvinside, Glasgow, of Dr. JOHN ALEXANDER, in his 71st year. He received his medical education at Aberdeen and at the London Hospital, graduating M.B., C.M. (with highest honours) in 1874, and M.D. in 1877, of Aberdeen University. After holding resident appointments in London and at Paisley, he became at a comparatively early age medical superintendent of the Western Infirmary, Glasgow. In the eight years during which Dr. Alexander was superintendent the Western Infirmary became doubled in size, and made very considerable progress in its reputation as a teaching school. On retiring from the office of superintendent he was appointed to the honorary medical staff, and after acting as a dispensary physician became an assistant physician to the infirmary. He was also an examiner in medicine at Aberdeen University. He is survived by two sons and a daughter.

DR. JOHN EDWARD DUNN of Preston, who died suddenly shortly after his return from a holiday at Blackpool, was educated at St. Thomas's Hospital Medical School, where he was prosector of anatomy and prizeman in 1879–80. He took the diplomas of L.R.C.P.Edin. and M.R.C.S.Eng. in 1883. He was consulting medical officer of the Preston Royal Infirmary, certifying factory surgeon and district medical officer and public vaccinator of the Preston Union. He was a member of the Preston Division of the British Medical Association. He was a justice of the peace, and had been mayor of Preston in 1897–98.

WE regret to record the death of NORMAN J. MCKIE, M.D.Edin., for upwards of thirty years in practice in Newton-Stewart, Wigtown, and the surrounding widely scattered district. Abandoning rural practice in the beginning of the year to take up, for a time at least, the less strenuous life of a ship's surgeon, he joined the Cunard–Anchor Line, and was appointed to the ss. *Algeria* on the Glasgow–New York service. Unfortunately, however, he did not complete his first voyage. Death came with startling swiftness, and he was buried at sea. Dr. Norman McKie was associated very intimately with the life of the district he so faithfully served. A man of high culture, he made several notable contributions on the archaeology of his surroundings. More particularly was he a heraldic student of high skill, solving the graving of many important historical stones which from time to time were laid bare in the south-west of Scotland. Before he took leave of the countryside he knew and loved so well the public showed their appreciation by entertaining him and presenting himself and his wife with valuable gifts. His widow and two young sons are left to mourn his loss.

DR. HERBERT KIDSON WALLACE died suddenly at Sunderland on July 29th, aged 46. He was the third son of the late Rev. Dr. Wallace of Sunderland and Hamilton, and was educated at Glasgow, where he graduated B.Sc. in 1893, M.B. and C.M. in 1896, and M.D. in 1905. He was medical officer and public vaccinator of the Bishop-Wearmouth Central District of the Sunderland Union. He took a temporary commission as lieutenant in the R.A.M.C. on May 15th, 1915, was promoted to captain after a year's service, and served up to the end of the war.

DR. RICHARD PRICE of Ashton-under-Lyne, who died recently after a short illness, received his medical education at Owens College, Manchester. He took the Scottish triple qualification in 1893, the D.P.H.Vict.Manch. in 1911, and graduated M.D.Durh. in 1913. He was medical officer of health for Hurst Urban District, and was a town councillor and chairman of the Education Committee. He gave much time and attention to local health and education matters, and his labours were highly appreciated by his townsmen. He was medical referee under the Ministry of Pensions, and had held a temporary commission in the R.A.M.C. during the war. He was accorded a military funeral, which was attended by representatives from all sections of the community. His loss at the early age of 48 is greatly regretted by his professional brethren. He leaves a widow and one son.

DR. VICTOR DONALD ORR LOGAN, of Sefton Park, Liverpool, died in London on July 22nd, aged 35, from injuries received by being run down by a motor cycle in Bayswater. He was educated at Edinburgh, where he graduated M.B. and Ch.B. in 1909, and after filling the posts of resident medical officer at the Prince of Wales's Hospital, Tottenham, the Sussex County Hospital, Brighton, and St. Mary's Hospital, Plaistow, went into practice in Liverpool. He took a temporary commission as lieutenant in the R.A.M.C. on October 10th, 1914; was promoted to captain after a year's service; served in the 17th General Hospital in France and Egypt; and was severely wounded and taken prisoner in the battle of the Somme in August, 1916.

DR. WALTER OLIPHANT WALKER died on August 3rd at his residence, 112, Gilmore Place, Edinburgh. After taking the degrees of M.A. (with first-class honours in mathematics) and B.Sc. at the University of Edinburgh he began the study of medicine, and graduated M.B., C.M. in 1882. He acted as assistant at Campbeltown and Dunbar, and then began practice at Skane, Aberdeenshire, where he remained four years. In 1889 he returned to Edinburgh, and gradually built up for himself a considerable practice. He took a keen interest in his profession, and had a high reputation as an obstetrician. He was well known and highly respected in the district. For over thirty years he gave gratuitous service to St. Joseph's Home, an institution carried on for the aged and infirm by the Little Sisters of the Poor. His work in this connexion has been gratefully acknowledged by the Mother Superior. Dr. Walker, who was unmarried, was in his 64th year.

WE regret to record the death of Dr. WILLIAM FRANCIS COPLEY WOODHEAD, of Blackpool, which occurred on August 25th, in his 64th year. He was the son of a medical practitioner and was born in Leeds; he received his medical education at Leeds and Edinburgh, taking the diplomas of L.R.F.P.S.Glas. in 1885, and L.R.C.P.Edin. in 1889. Except for an interval of about eighteen months,

which he spent in Australia, Dr. Woodhead had practised in the Blackpool district for some twenty years. He was an old member of the British Medical Association, and only retired from active practice quite recently. He is survived by his widow and five daughters.

DR. RUSSELL STEWART WINGFIELD of Philadelphia died on August 23rd as the result of burns received in a fire which destroyed the American Red Cross children's hospital at Salonika on August 14th. The fire broke out in the hospital dispensary. Dr. Wingfield, who acted with great courage, succeeded in saving all the patients and staff, with the exception of one Greek interpreter. Dr. Wingfield, who was 26 years old, was born in Richmond, Virginia, and was a graduate of the University of Richmond and Medical College of Virginia. He enlisted in the American Army Medical Corps immediately on the American declaration of war and served as a State inspector of draft boards. After the war he became resident physician at the Stetson Hospital in Philadelphia, a post he relinquished to come to Europe in February last to serve with the Red Cross. He was at once sent to Salonika to take charge of the children's hospital at the Kalamaria refugee camp.

A SYMPATHETIC obituary notice of Sir Felix Semon by Sir StClair Thomson appears in the *Revue de laryngologie* of July 31st.

Universities and Colleges.

UNIVERSITY OF LONDON.

ROLL OF WAR SERVICE.

MANY others besides those who have themselves been members of the Officers' Training Corps of the University of London will welcome the *Roll of War Service, 1914–1919*,[1] published by the Military Education Committee of the University. It supplies a record of all the fallen and of the circumstances in which they died; a list of all those who received honours and awards, the citations accompanying such grants being quoted in full; and details of the services, whether abroad or at home, of all officers, former officers, and former cadets of the University of London Officers' Training Corps, known to have rendered commissioned service in the war between August 5th, 1914, and November 11th, 1918. The roll of the fallen contains 665 names, the total number of those who served being 4,276. Of these, 1,068 gained between them 1,726 honours and distinctions. Five officers were awarded the Victoria Cross, and photographs of them are supplied. One of them, J. Fox Russell, was a captain in the R.A.M.C., but, as in the case of two others of the group, he was killed in action. The frontispiece is a picture of the first adjutant of the Corps, Lieut.-Colonel A. E. Egerton, who, like so many others, was killed in action before the harvest of honours had ripened. There are three appendices, one of which deals with statistics, another with the establishment of the Corps at its initiation in 1909, and a third with its doings from that date to the spring of 1920. From the first of these we gather, but not too easily, that in the matter of the number of officers supplied by the medical schools of the University the place of honour belongs to St. Bartholomew's and Guy's, each of them sending 235.

UNIVERSITY COLLEGE.

The Primary Fellowship course in physiology will begin on Wednesday, September 21st, at 2 p.m.

UNIVERSITY COLLEGE HOSPITAL MEDICAL SCHOOL.

The Goldsmid Entrance Exhibitions of 112 guineas each have been awarded to A. E. Blake Pritchard, King's College, Cambridge, and N. L. White, St. John's College, Cambridge.

[1] *Roll of War Service, 1914–1919.* University of London Officers' Training Corps. London: Published by the Military Education Committee. 1921. (Roy. 8vo, pp. 371. Cloth, £1 1s.; half-leather, £1 11s. 6d.; full leather, £2 2s.)

THE movement known as Health Week has as its object to focus public attention for one week in the year on matters of health, and to arouse a sense of individual responsibility for health, without which all public health work must fall short of its aims. The Health Week Committee is working in co-operation with the National Baby Week Council, and local committees are being formed all over the country, comprising representatives of every public body and private society in any way concerned with health, and of every agency which has influence with any considerable section of the community. This year Health Week will be held from October 9th to 15th, and the secretary of the movement is Mr. E. White Wallis, 90, Buckingham Palace Road, S.W.

Medical News.

AT the opening of the Grosvenor telephone exchange as a relief exchange the numbers of certain medical subscribers in London have been altered. A list showing the members of the medical profession involved, and the date of transfer, may be seen at the Library of the British Medical Association.

THE Ministry of Pensions desire to call the attention of officers, nurses, and men, and widows and dependants of deceased officers and men who served during the great war, to the fact that any new claim to pension, grant, gratuity, or allowance in respect of disablement must be made within seven years after the date on which the claimant was discharged, or within seven years after the official date of the termination of the war (August 31st, 1921), whichever date is the earlier. A person is deemed to have been discharged from the service at the time when his active service terminated. Any claimant (including the widow or other dependent relative of a deceased officer or man) who desires to appeal to a Pensions Appeal Tribunal against the rejection of a claim to pension must do so within a period of twelve months after the date of the rejection or after the date of the commencement of the Act (August 19th, 1921), whichever is the later date.

THE Guy's Hospital biennial dinner will be held on Wednesday, October 26th, at the Connaught Rooms, London. Mr. Montagu Hopson will preside, and tickets, price 15s. exclusive of wine, may be obtained from Mr. Arthur W. Ormond, C.B.E., F.R.C.S., 7, Devonshire Place, Upper Wimpole Street, W.1.

WE have received a copy of the form of certificate referred to in the Order issued under the Dangerous Drugs Act, 1920, authorizing farmers and stockowners to purchase tincture of opium for administration to animals. The person holding the certificate must not have in his possession more than 32 oz. at any one time, and he may only purchase from the particular person whose name he writes on the certificate. The date of purchase and the quantity purchased must be filled in by the supplier on each occasion of any purchase by the holder. Bottles or vessels containing the tincture must be labelled with the words "For administration to animals only."

THE annual dinner of old students of University College Hospital will be held at the Imperial Restaurant, Regent Street, on Thursday, October 6th, at 7.30 p.m., when the chair will be taken by Dr. Henry D. Waugh. The secretaries are Dr. A. M. H. Gray and Mr. Gwynne Williams.

A VACATION course in pediatric surgery and orthopaedics will be conducted by Dr. H. L. Rocher, of the Faculty of Medicine of Bordeaux, from October 12th to 17th. Further particulars may be obtained from Dr. Rocher, Orthopaedic Clinic, 91, Rue Judaique, Bordeaux.

THE Home Secretary has appointed a committee to re-examine the question of the danger from the use of lead paints to workers in the painting trades, the comparative efficiency and cost, and the effect on the health of the workers, of paints containing lead and leadless paints respectively; and to advise whether any modification of the conclusions and recommendations of the Departmental Committees appointed in 1911 has become necessary. The members of the Committee are the Right Hon. Sir Henry Norman, Bt., M.P. (Chairman), Mr. Gerald Bellhouse, C.B.E., Dr. O. J. Kauffmann, Dr. Thomas M. Legge, C.B.E., Mr. Alan Munby, F.R.I.B.A., Mr. Alexander Scott, F.R.S., D.Sc., and Mr. H. O. Weller. The secretary is Mr. C. W. Price, of the Home Office, Whitehall, S.W.1, to whom any communications should be addressed.

A SPECIAL post-graduate course will be held at the North-East London Post-Graduate College (Prince of Wales's General Hospital, Tottenham), in association with the Fellowship of Medicine and the Post-Graduate Medical Association, from September 26th to October 8th. Demonstrations and clinical lectures will extend over practically the whole day, from 10.30 a.m. to 5.30 p.m., and will include subjects from the various branches of medicine and surgery. Luncheon is obtainable in the neighbourhood of the hospital, and tea will be provided each day. The fee for the complete course, to those not members of the Fellowship of Medicine, is 5 guineas, or 3 guineas for either week. Applications to attend the course should be sent not later than September 22nd to the dean at the hospital, or to the Secretary of the Fellowship of Medicine at 1, Wimpole Street, W.1.

THE twenty-fifth French Congress of Medicine, the thirtieth French Surgical Congress, the third annual meeting of the Société d'Orthopédie, and the twenty-first

French Urology Congress will all meet at Strasbourg from October 3rd to 6th. The medical and surgical associations hold a common session the first day to discuss anti-anaphylaxis as presented by Widal, in addition to reports on the heart, lungs, and digestive tract. The main topics for discussion at the Surgical Congress are traumatic epilepsy, vaccine therapy in joint disease, and the remote results of treatment of mammary cancer. The Orthopaedic Society will discuss arthrodesis of the foot, ankylosis of the knee, and non-operative treatment of congenital luxation of the hip-joint, and the urologists anaesthesia of the urinary passages.

THE University College War Memorial Committee asks for assistance in completing two publications now in course of preparation; the first is the *Pro Patria* list of those who served in the war; it now contains some 3,000 names. Should there be any alumni by whom or their relatives papers of inquiry have not been received they are asked to communicate at once with Sir Gregory Foster, chairman of the committee and of the college. A War Memorial Album, containing the records and portraits of alumni who gave their lives in the war, is also in preparation. The committee has not yet been able to obtain full particulars of some eighty men known to have fallen. If the War Memorial Album form has not been received by relatives of any man who died, they are asked to communicate with the chairman.

THE second part of the third course of lectures and practical courses of instruction given at the Maudsley Hospital for the diploma of psychological medicine will commence on October 3rd, when Sir Frederick Mott will give the first of six lectures on the pathology of mental diseases, including brain syphilis; and Dr. Bernard Hart will begin a course of eight lectures on the psycho-neuroses. Courses on the practical aspect of mental deficiency by Dr. F. C. Shrubsall, on crime and insanity by Dr. W. C. Sullivan, and on symptoms of mental disease by Dr. E. Mapother, will begin in the same week. A series of demonstrations will be given by Dr. F. Golla, Dr. C. Hubert Bond, and Sir Frederick Mott. Full particulars can be obtained on application to Sir Frederick Mott, M.D., F.R.S., at the Maudsley Hospital, Denmark Hill, S.E.5.

ALTHOUGH flag days have rather fallen out of favour, there is one honourable exception which continues to be held every year—"Our Day," the flag day of the Joint Council of the Order of St. John and the British Red Cross Society, which this year will take place on October 1st. The peace work of the Joint Council includes contributions in support of hospitals, help to the Central Council for Infant and Child Welfare, dépôts for the hire of surgical and sick-room requisites, and a motor ambulance service throughout the country. Further particulars may be had from Sir Arthur Stanley, 19, Berkeley Street, W.1.

THE next international congress of urology will be held at Rome under the presidency of Professor Roberto Alessandri.

THE annual conference of public health officers and public health nurses of New York State will be held at Cornell University, Ithaca, from September 13th to 15th.

AMONG the subjects to be discussed at the second congress of French-speaking gynaecologists and obstetricians, which, as already announced, will be held in Paris from September 29th to October 1st, are the following: disorders of thyroid function in their relation with pregnancy; medical and social protection of the pregnant woman; indications for abdominal hysterectomy in labour (in addition to pelvic deformities); hysterectomy in acute puerperal infection; and radium therapy (*a*) in fibroid tumours, (*b*) in cancer of the cervix and body of the uterus, (*c*) in metrorrhagia (not including uterine cancer and fibroids). The secretaries of the congress are Drs. Brindeau, 71, Rue de Grenelle, and Couvelaire, 21, Rue Louis-David, Paris.

APPLICATIONS for training in some occupation other than nursing from nurses in receipt of a disability pension, who by reason of any disablement due to war service are unable to return to their pre-war occupation, must reach the Controller, Women's Training Branch, Ministry of Labour, St. Ermin's, Caxton Street, London, S.W.1, on or before October 31st, 1921.

THE dedication of a bronze tablet in honour of 185 graduates of Syracuse University College of Medicine who served in the great war took place during the recent commencement exercises held at the college.

IT is reported that Western Reserve University, U.S.A., has received 500,000 dollars from Mr. Samuel Mather to be used in the construction of the new medical college building.

Letters, Notes, and Answers.

As, owing to printing difficulties, the JOURNAL *must be sent to press earlier than hitherto, it is essential that communications intended for the current issue should be received by the first post on Tuesday, and lengthy documents on Monday.*

ORIGINAL ARTICLES and LETTERS *forwarded for publication are understood to be offered to the* BRITISH MEDICAL JOURNAL *alone unless the contrary be stated.*

CORRESPONDENTS who wish notice to be taken of their communications should authenticate them with their names—of course not necessarily for publication.

AUTHORS desiring reprints of their articles published in the BRITISH MEDICAL JOURNAL are requested to communicate with the Office, 429, Strand, W.C.2, on receipt of proof.

IN order to avoid delay, it is particularly requested that ALL letters on the editorial business of the JOURNAL be addressed to the Editor at the Office of the JOURNAL.

THE postal address of the BRITISH MEDICAL ASSOCIATION and BRITISH MEDICAL JOURNAL is 429, Strand, London, W.C.2. The telegraphic addresses are:

1. EDITOR of the BRITISH MEDICAL JOURNAL, *Aitiology, Westrand, London*; telephone, 2630, Gerrard.
2. FINANCIAL SECRETARY AND BUSINESS MANAGER (Advertisements, etc.), *Articulate, Westrand, London*; telephone, 2630, Gerrard.
3. MEDICAL SECRETARY, *Mediocera, Westrand, London*; telephone, 2630, Gerrard. The address of the Irish Office of the British Medical Association is 16, South Frederick Street, Dublin (telegrams: *Bacillus, Dublin*: telephone, 4737, Dublin), and of the Scottish Office, 6, Rutland Square, Edinburgh (telegrams: *Associate, Edinburgh*; telephone, 4361, Central).

QUERIES AND ANSWERS.

"F. B. C." asks for help in the diagnosis of the following case. A young married woman, aged 31, has dilatation of the left pupil during the day; at night this pupil tends to contract and becomes smaller than the right, which dilates normally in the dark. The left patella reflex is exaggerated, but the right is difficult to elicit. She is rather emotional.

DR. J. A. BALL.—The gravel filter is probably too small, and the effluent from the cisterns is being passed through it too rapidly. Some other material (such as coke breeze), either in conjunction with the sand or otherwise, might be tried as a filtering material, but it is essential that the process of filtering should be slow.

INCOME TAX.

"T. B." has sold his partnership owing to ill health, and is now able to do "very light work." The inspector of taxes has notified him that he will be assessed at £250, and that he should give notice of objection in due course if that amount is considered excessive.

*** "T. B." is in effect starting a new source of profit, and in our opinion the more usual course for the revenue authorities to adopt is to leave the question over until the end of the first year of the new work. In this case an estimated assessment is being made beforehand, but that will not prejudice our correspondent if he gives notice of objection on receiving the formal notice of the assessment. That will necessarily put the matter in abeyance until "T. B." can supply particulars of his earnings for 1921. As the partnership was sold as from December 31st, 1920, a claim can be made, so far as "T. B." is concerned, for an adjustment, as between himself and the purchaser, of the tax payable for the financial year ended April 5th, 1921.

"DUNELM." sold his practice as from December 31st, 1920, but continues to receive payments from outstanding professional debts. Is he liable to income tax thereon for 1921–22?

*** No. "Dunelm." is not in receipt of any "income" from the practice for 1921–22; that income terminated with his sale of the practice, and what he is now receiving represents realizations of debts accumulated during his professional work. Of course, if he is doing some specialist's work he would be liable to assessment on any income arising therefrom. It would be advisable for him to see his local inspector of taxes and explain the whole position. He has a right to amend his return, or could appeal against an assessment made thereon.

"PURCHASER" inquires whether any deduction can be claimed for the cost of the purchase of the premises used for the practice which was compulsory, no alternative premises being available.

*** No portion of the cost of purchase can be deducted, but as from the date of the transfer a proportion of the net Schedule A assessment can be deducted in lieu of the proportion of rent. If a loan has been obtained in connexion with the purchase, income tax at 6s. should be deducted from the interest paid, unless it is paid to the bank, in which case an allowance can be claimed by application to the local inspector of taxes.

"W. S. M." has made his returns since 1909 on the usual basis of cash receipts; the inspector of taxes now claims to add to his returns one-third of the debts outstanding as at March 31st, on the ground that the *increasing* income of the practice is not fairly represented by the increase in cash receipts.

*** We feel rather strongly that this claim on the part of the local revenue official should be firmly resisted. The "cash basis" method has been recognized by the Board of Inland Revenue—except as regards a new practice—for many years as the best method of ascertaining the profits of a medical practice; it has been followed by the profession in, we believe, practically every case, even where through personal or general causes the income of the practice is declining and the circumstances accordingly are the converse of those obtaining in this case. A general rule of this kind becomes useless and unfair if it is to be set aside whenever it operates to the prejudice of the Revenue, and followed in all other instances. If, for example, "W. S. M." has purchased an additional practice, so that his present one may be properly regarded as "new" for this purpose, the inspector's action would be justified; but apart from some very exceptional circumstances of that kind, we think it should be opposed. We therefore suggest that "W. S. M." represent this view to the inspector, and if unable to convince him that the cash basis should be adhered to, should place the facts before the Secretary, Inland Revenue, Somerset House.

LETTERS, NOTES, ETC.

A Disclaimer.

MR. BECKWITH WHITEHOUSE, M.S., F.R.C.S. (Honorary Obstetric Surgeon, General Hospital, Birmingham), writes: It has been brought to my notice that in the issue of the London *Daily Mail* dated August 31st a paragraph is published in which my name occurs, with reference to a case of Caesarean section. I wish to disclaim any connexion with the publication of the same, and at the same time to enter a vigorous protest against the exposure of such medical details in the lay press.

Effect of *X* Rays on Bacteria.

DR. E. BAYLIS ASH (Moseley, Birmingham) writes: Whilst radiologist to the 38th Stationary Hospital, a limited amount of experimental work on the effects of soft *x* rays on bacteria *in vitro* was attempted; the results may be of interest. Cultures of *B. coli communis* and *Staphylococcus aureus* in Petri dishes were exposed to rays at a distance from the anticathode of 30 cm.; no filters were interposed and no covers used to the dishes. The dosage in all the exposures equalled fifteen times a Sabouraud pastille dose (B tint). The tube used passed 15 milliampères and a Bauer qualimeter registered 5–7 as a measure of the hardness of the rays. The cultures were placed in an incubator at 37° C. for twenty-four hours. At the end of this time examination of the growths in the case of both bacteria showed that fresh colonies had been thrown out at the periphery and that the growth of the bacilli and cocci was not inhibited. Microscopically no changes in bacteria could be found due to the rays. Apparently the above dosage was insufficient to sterilize the culture media; very much longer exposures would have been necessary, and these could not be given with the limited apparatus in use.

The Formol-Gel Reaction in Syphilis.

DR. M. W. BROWDY (London, W.) writes to express his agreement with Mr. A. Murray Stuart's opinion in the BRITISH MEDICAL JOURNAL of August 13th that this reaction is of no value in the diagnosis of syphilis. When the test was first described (he continues) I compared the result of thirty specimens examined by Professor Dean, of Manchester University, for the Wassermann reaction with the formol-gel test done by myself, and in no case did I find an agreement. Hence I discarded the new test.

Gas Disease of Fish.

SOME time ago a contributor to the *Fishing Gazette* suggested that fish in water directly below a big fall might get too much oxygen, and the editor of the *Fishing Gazette*, Mr. R. B. Marston, now (August 27th) finds confirmation of the theory in a paper by Professor Marianne Plehn, of the Biological Experimental Institute, Munich. The facts, however, do not seem to us to point in this direction. It appears that a rise in the temperature of water containing a large proportion of oxygen may be attended by a serious mortality in young fry. When examined many of the fry are seen to present bubbles in the peripheral vessels of the skin and mucous membrane, in the orbit, and in other places, and it is supposed that similar gas emboli in internal organs may cause death. Water at 20° C. can hold less oxygen than water at 10° C. As fish are cold-blooded animals their temperature is that of the surrounding water, and it is conceivable, of course, that when the temperature of the water rises rapidly, oxygen or any other gas dissolved in the fish's fluids may be liberated in the vessels or tissues; but in no ordinary circumstances can water be "super-saturated" with oxygen, as Mr. Marston supposes, unless under more than atmospheric pressure. The gas disease of fish seems to present a similarity to the caisson disease observed in divers.

London "Toll" Telephone Exchange.

As we have already announced in this column, the Post Office is about to separate the longer distance from the shorter distance trunk telephone traffic and to erect a special exchange for handling the latter on more economical and expeditious lines. The exchange, which will be known as the London Toll Exchange, is now approaching completion, and is expected to be in full operation at the end of September. In designing the switching apparatus new facilities have been introduced for the operation of the calls, so that connexions to the provincial towns served by the exchange may be obtained on demand. These arrangements will involve a change of procedure on the part of the public and the staffs in the London exchanges. Under the new system a London subscriber wishing to call any provincial town within approximately twenty-five miles radially from the centre of London will ask for "Toll" instead of "Trunks." He will be connected to the London Toll Exchange, where the telephonist who answers will record particulars of the number and establish the connexion to the desired subscriber. We are informed that the call will usually be completed whilst the caller waits on the line, as in the local service. Cables to provide additional lines are being laid where necessary on the provincial routes. Many of these lines will be ready when the new service commences; but until the service is in full operation a short delay may be experienced on some routes during the busier hours of the day. When a call cannot be connected on demand, owing to the lines being engaged, a subscriber's application will be booked and completed as soon as the telephonist is able to find a free line, when the subscriber will be rung up as in the case of a trunk call; but on the completion of the various cabling schemes delays of this nature should be infrequent. In addition to the traffic outgoing from London, the Toll Exchange will deal with the traffic incoming from the provincial towns involved in the scheme. The more important of these are: Ascot, Aylesbury, Bishop's Stortford, Buckingham, Dorking, Egham, Gerrard's Cross, Hatfield, Hertford, High Wycombe, Leatherhead, Luton, Maidenhead, Potter's Bar, Rickmansworth, St. Albans, Sevenoaks, Slough, Staines, Tring, Uxbridge, Walton-on-Thames, Watford, Weybridge, Windsor, and Woking.

Motorists' Lighting Regulations.

IN view of the numerous inquiries received by the Automobile Association as to the effect of the expiry of the regulations made under D.O.R.A. in relation to the lighting of motor vehicles, the association points out that whilst the return to pre-war conditions would appear to (*a*) relieve motor cyclists (solo machines) from the necessity of showing a red light to the rear, (*b*) render it no longer compulsory for motor cars to exhibit a front light on the near side, (*c*) alter the lighting-up period to from one hour after sunset to one hour before sunrise (instead of half an hour in each case as under D.O.R.A.), etc., there are still a number of *local* by-laws in existence, some of which substantially vary the provisions of the general law. Further, notwithstanding the alteration in lighting-up times, the requirement of the Roads Vehicles (Registration and Licensing) Regulations that the registration number must be illuminated from half an hour after sunset to half an hour before sunrise is still in force. There is also the possibility of further legislative changes, and the Automobile Association advises motorists for the present not to make any alteration in their existing lighting arrangements.

Vacancies.

NOTIFICATIONS of offices vacant in universities, medical colleges, and of vacant resident and other appointments at hospitals, will be found at pages 30, 31, 35, 36, and 37 of our advertisement columns, and advertisements as to partnerships, assistantships, and locum tenencies at pages 32, 33, and 34.

THE Chief Inspector of Factories announces the following vacant appointments: Hoo (Kent), Knottingley (Yorks, West Riding), Preston, West (Lancs.), Stevenage (Hertford), Catrine (Ayr), Carnoustie (Forfar).

SCALE OF CHARGES FOR ADVERTISEMENTS IN THE BRITISH MEDICAL JOURNAL.

	£	s.	d.
Six lines and under	0	9	0
Each additional line...	0	1	6
Whole single column (three columns to page)	7	10	0
Half single column	3	15	0
Half page	10	0	0
Whole page	20	0	0

An average line contains six words.

All remittances by Post Office Orders must be made payable to the British Medical Association at the General Post Office, London. No responsibility will be accepted for any such remittance not so safeguarded.

Advertisements should be delivered, addressed to the Manager, 429, Strand, London, not later than the first post on Tuesday morning preceding publication, and, if not paid for at the time, should be accompanied by a reference.

NOTE.—It is against the rules of the Post Office to receive *poste restante* letters addressed either in initials or numbers.